EE6302 Control System Design

Unit 1: Introduction to Control Systems
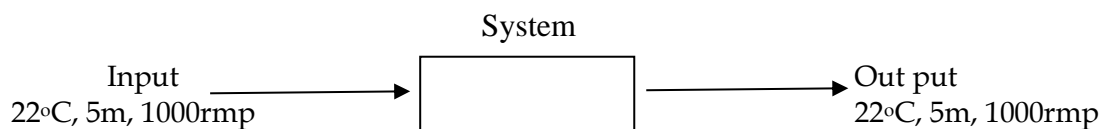

System

An arrangement or combination of different physical components that are connected together to form an entire unit to achieve a certain objective is called a system.

Control

Controlling is to regulate or direct a system so that a desired objective is achieved. That's mean control is a process of forcing system variables to reach to a desired value which is called a reference value.

Control System

Control System is an arrangement of different physical elements which are linked in such a manner so as to regulate or direct it to obtain a certain objective.

A control system must have
- Input
- Output
- Way to achieve input and output objectives
- Control action

### Manual Control System and Automatic Control System

A system that involves a person for controlling as in driving in auto mobile is called a manual control system.
A system that a person doesn't involve for controlling is called an automatic control system. It is like a robot in an automated plant.
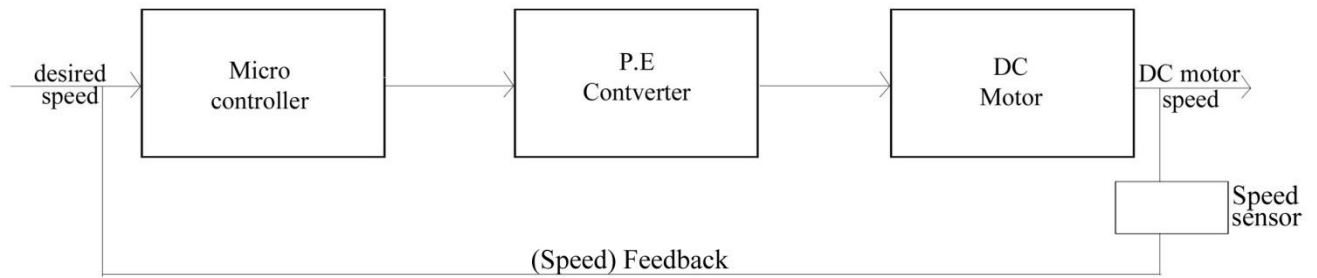
Open – Loop control and Closed –Loop control

If the system does not use a measure of the system output in computing the controlling action, the system is in *open loop control*. If the system output is measured and fed back to the control computation, the system is in *closed loop or feedback control*. Automatic control system can be in open-loop control or in closed – loop control.

Example : DC Motor speed control system.
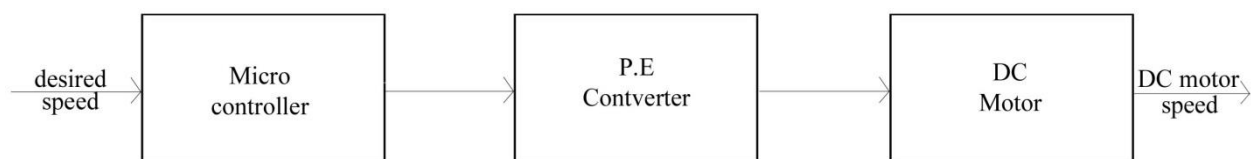
Component block diagram for dc motor speed control in open-loop

Component block diagram for dc motor speed control in closed-loop

In the closed loop control system (Feedback controls system).The variable being control such as the speed in our example is measured by a sensor and the measured information is fed back to the controller to compute the control action.

General block diagram for a closed-loop control system

- The central component of this feedback system is the process whose output is to be controlled. In our example the process is the dc motor.
- The disturbance is something interferes to the process output that's mean the signal that has some adverse effect on the value of the output of a system for instance in our example, the change of resistance in the motor due to temperature is a disturbance.
- The actuator is the device which gets the controlled signal from the controller and converts into the variable which influences the process output. In our previously discussed example the P.E converter is the actuator.
- The combination of the process and the actuator is called the plant.
- The components that actually compute the desired control signal is the controller. It decides suitable control signal to the actuator.
- The sensor typically converts the physical variable into an electrical signal to use in the controller. It should be noted that the sensor is incorporated with sensor noise.
- The role of the input filter is to convert the reference signal to a suitable from which can be used at the comparing link. The comparing link comp used the difference between the reference signal and the sensor o/p to give the controller a measure of the system error.