

References:

1. URL :<http://imtiazhussainkalwar.weebly.com>.
2. Automatic control system by KUO.
3. Modern control Engineering by OGATA.

1.1 Introduction:

Automatic control has played a vital role in the advance of engineering and science. In addition to its extreme importance in space-vehicle systems, missile-guidance systems, robotic systems, and the like, automatic control has become an important and integral part of modern manufacturing and industrial processes. For example, automatic control is essential in the numerical control of machine tools in the manufacturing industries, in the design of autopilot systems in the aerospace industries, and in the design of cars and trucks in the automobile industries.

1.2 Definitions:

We shall define the terminology necessary to describe control systems.

- ❖ **Plants:** any physical object to be controlled, called plant or a plant may be a piece of equipment, perhaps just a set of machine parts functioning together, the purpose of which is to perform a particular operation such as a mechanical device.
- ❖ **Systems:** A system is a combination of components that act together and perform a certain objective.
- ❖ **Processes:** Any operation to be controlled called process. Examples are chemical, economic, and biological processes.
- ❖ **Reference Input:** Is the actual signal applied to a control system.
- ❖ **Output:** Is the actual response obtained from a control system.

- ❖ **Control unit (dynamic element):** The unit that reacts to an actuating signal to produce a desired output. This unit does the work of controlling the output and thus may be power amplifier.
- ❖ **Actuating signal:** The signal that is the difference between the reference input and the feedback signal.
- ❖ **Feedback element:** The unit that provides the means for feeding back the output quantity, or a function of the output, in order to compare it with the reference input.
- ❖ **Open-loop control system:** A system in which the output has no effect upon the input signal.

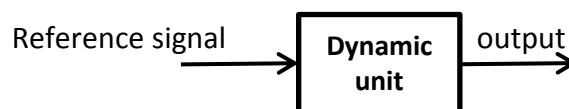


Fig. (1.1) Open-Loop control system

- ❖ **Closed-loop control system:** A system in which the output has an effect upon the input quantity in such a manner as to maintain the desired output value. That is, closed-loop control system is feedback control system.

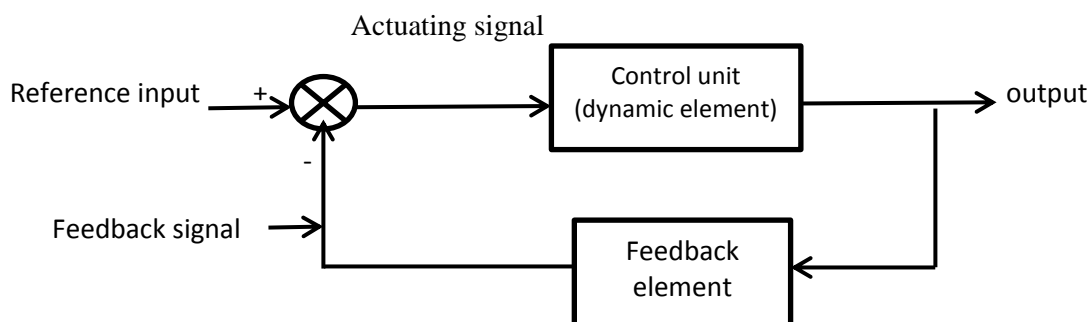


Fig. (1.2) Closed-Loop control system