CONTROL SYSTEM REPRESENTATION

Open-loop control system and Closed-loop control system:

Open-loop control system: It is a control system where its control action onlydepends on input signal and does not depend on its output response.

Closed-loop control system: It is a control system where its control action dependson both of its input signal and output response.

Open-loop control system:

It is a control system where its control action only depends on input signal and doesnot depend on its output response as shown in Fig.1.1.
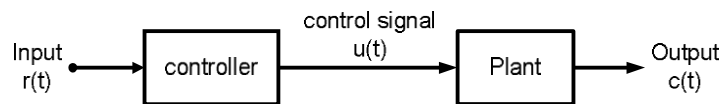

Fig.1.1. An open-loop system

Examples: traffic signal, washing machine, bread toaster, etc.

Advantages:

- Simple design and easy to construct
- Economical
- Easy for maintenance
- Highly stable operation

Dis-advantages:

- Not accurate and reliable when input or system parameters are variable innature
- Recalibration of the parameters are required time to time

Closed-loop control system:

It is a control system where its control action depends on both of its input signal andoutput response as shown in Fig.1.2.
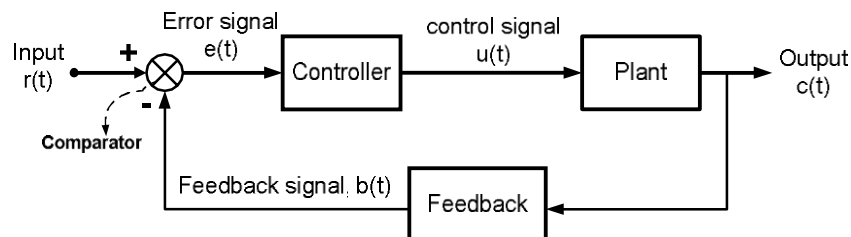

Fig.1.2. A closed-loop system

Examples: automatic electric iron, missile launcher, speed control of DC motor, etc.

Advantages:

- More accurate operation than that of open-loop control system
- Can operate efficiently when input or system parameters are variable innature

- Less nonlinearity effect of these systems on output response
- High bandwidth of operation
- There is facility of automation
- Time to time recalibration of the parameters are not required

Dis-advantages:

- Complex design and difficult to construct.

- Expensive than that of open-loop control system
- Complicate for maintenance
- Less stable operation than that of open-loop control system

Comparison between Open-loop and Closed-loop control systems:

It is a control system where its control action depends on both of its input signal and output response.

Sl. No.	Open-loop control systems	Closed-loop control systems
1	No feedback is given to the control system	A feedback is given to the control system
2	Cannot be intelligent	Intelligent controlling action
3	There is no possibility of undesirable system oscillation(hunting)	Closed loop control introduces the possibility of undesirable system oscillation(hunting)
4	The output will not very for a constant input, provided the system parameters remain unaltered	In the system the output may vary for a constant input, depending upon the feedback
5	System output variation due to variation in parameters of the system is greater and the output very in an uncontrolled way	System output variation due to variation in parameters of the system is less.
6	Error detection is not present	Error detection is present
7	Small bandwidth	Large bandwidth
8	More stable	Less stable or prone to instability
9	Affected by non-linearities	Not affected by non-linearities
10	Very sensitive in nature	Less sensitive to disturbances
11	Simple design	Complex design
12	Cheap	Costly