Chapter 1

Introduction

Outline

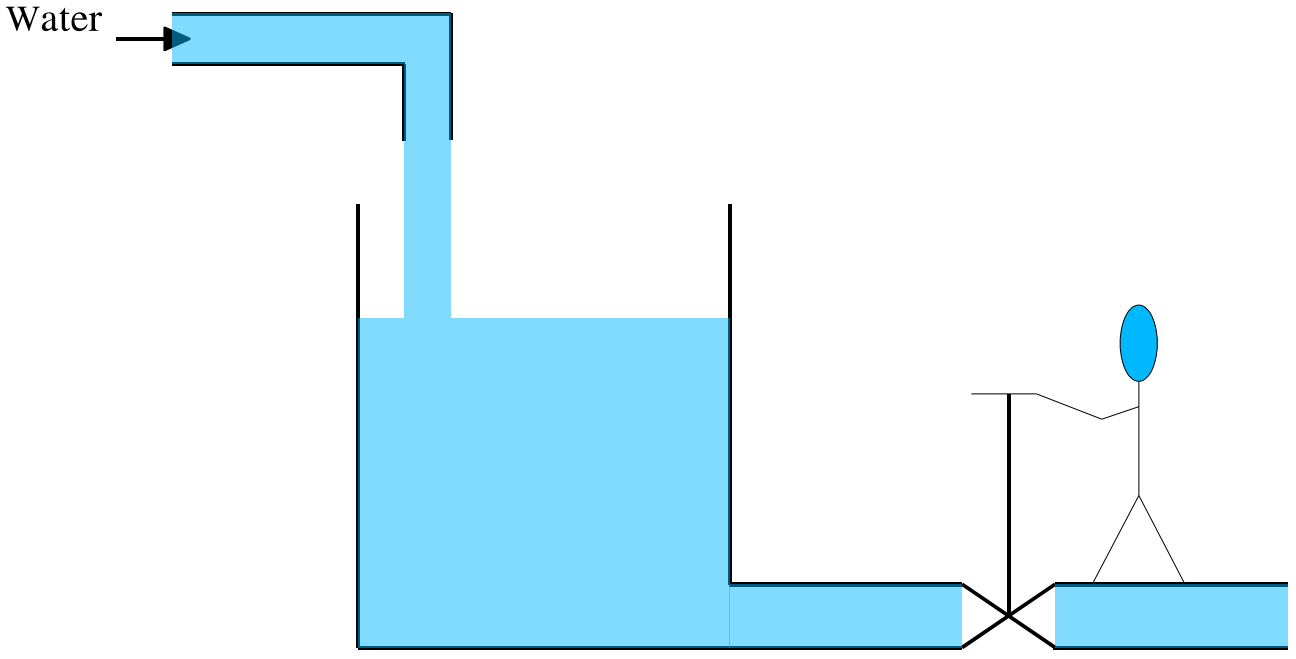
- Control System Definition.
- System Classification.
- Control System Configulation.
- Analysis and Design Objectives.
- Studying of Control System.

Control System Definition

Definition : A control system consists of sub-systems and processes assemble for a propose of controlling the outputs of the processes. We can simply say that :

- A Control System is a technic applied to processes in order to lead the outcome to satisfy the goal.

Manual feedback control



Objectives

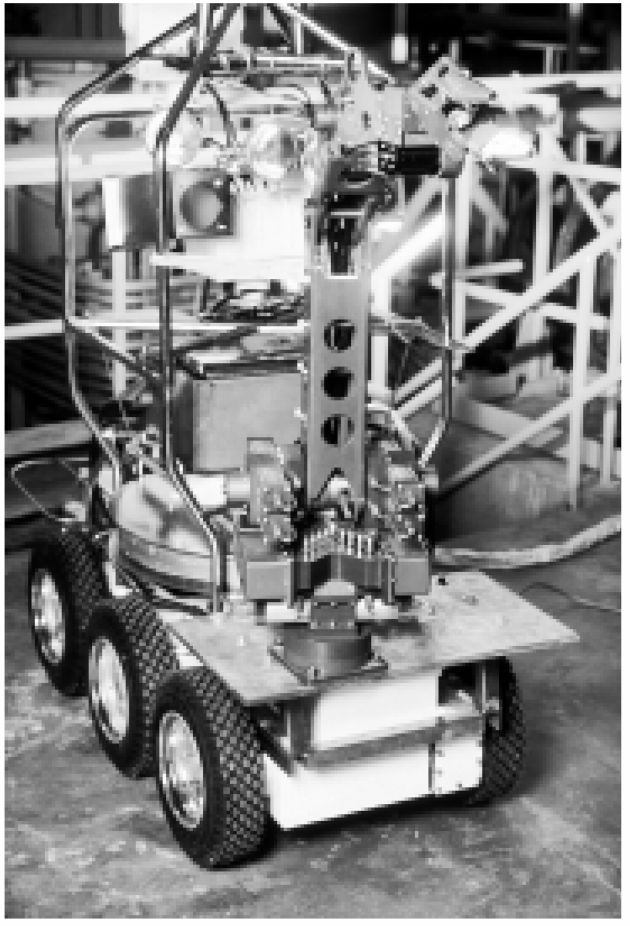
Results

Simplified description of a control system

System Classification

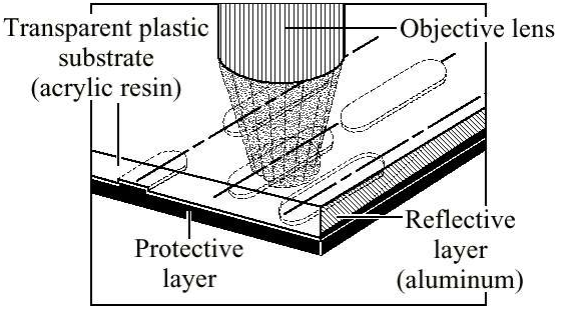
- Static or Dynamic Systems
- Continuous-Time or Discrete-time Systems
- Linear or Non-Linear Systems
- Lumped or Distributed Parameters
- Time-Varying or Time-invariant Systems
- Deterministic or Stochastic Systems

Rover was built to work in contaminated areas at Three Mile Island in Middleton, PA, where a nuclear accident occurred in 1979. The remote controlled robot's long arm can be seen at the front of the vehicle.

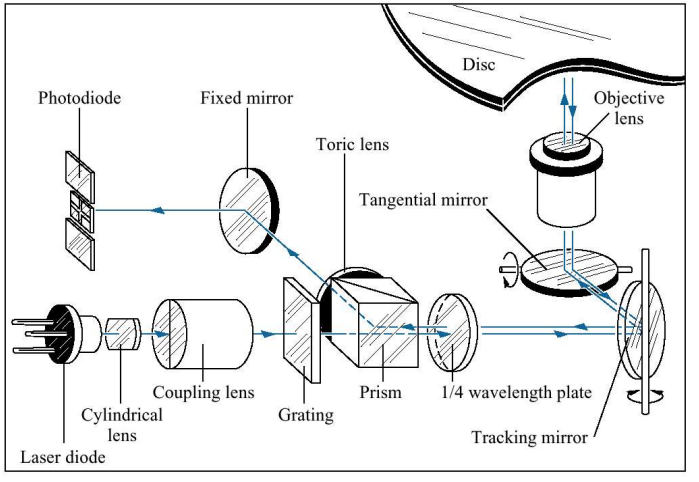


a. Video laser disc player;
b. objective lens reading pits on a laser disc;
c. optical path for playback showing tracking mirror rotated by a control system to keep the laser beam positioned on the pits.

(*a*)



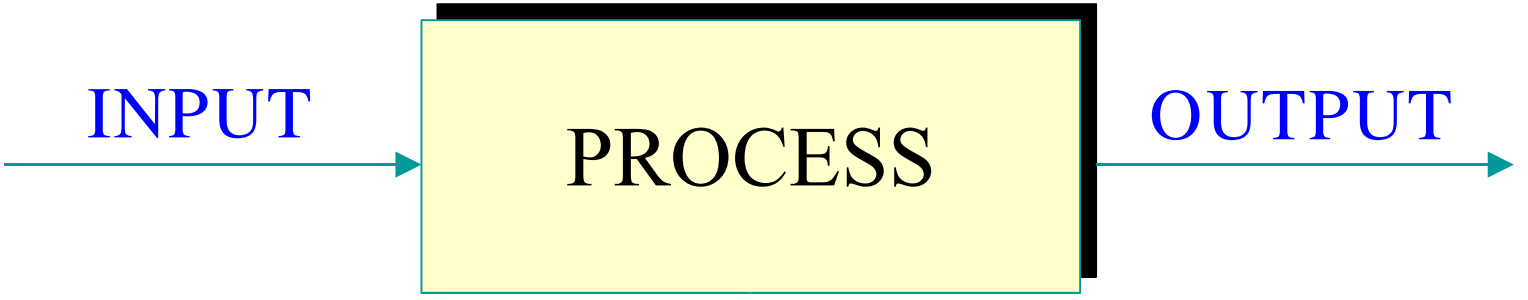
(*b*)



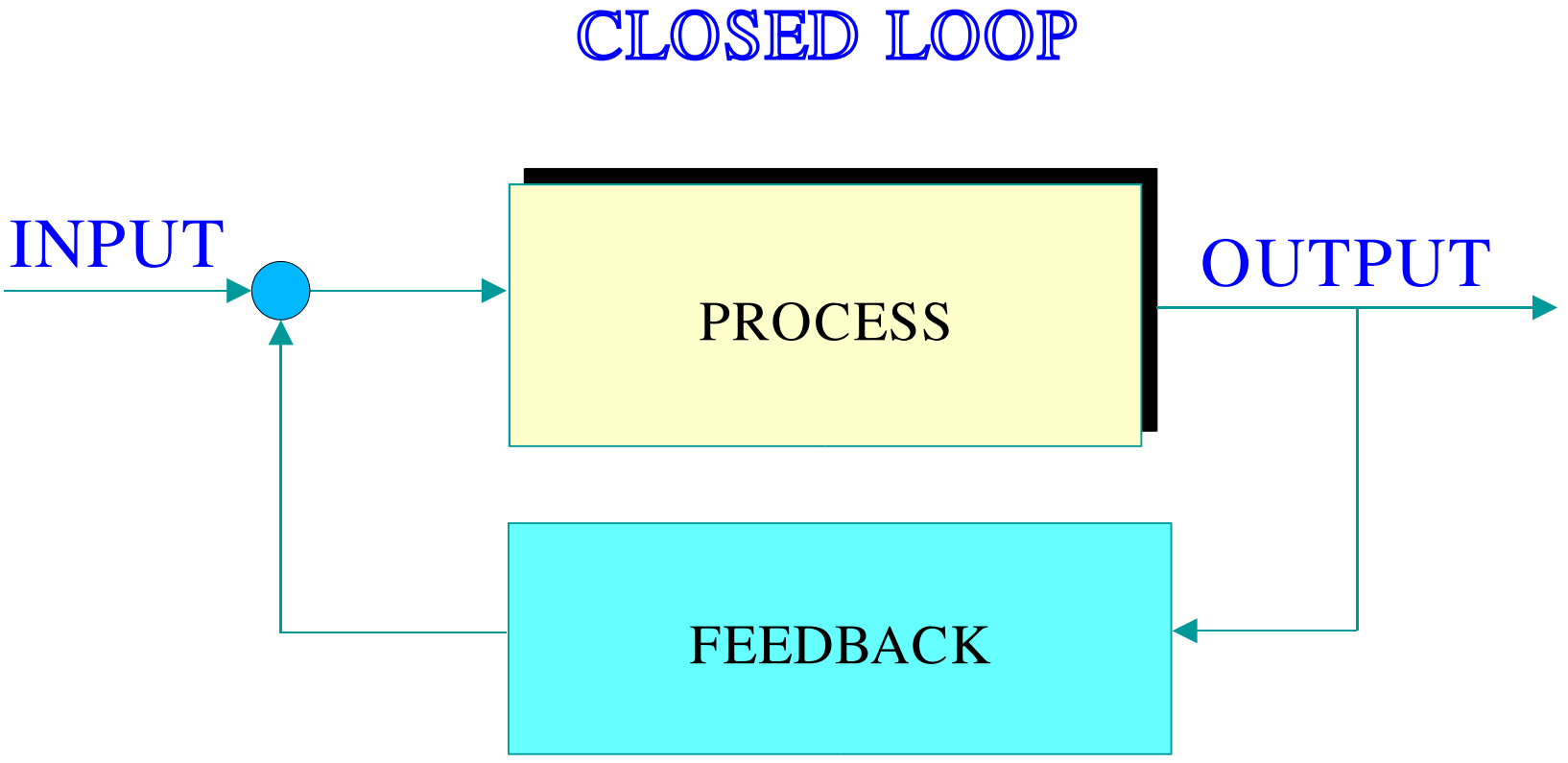
(*c*)

Control System Configulation

OPENED LOOP



Control System Configulation

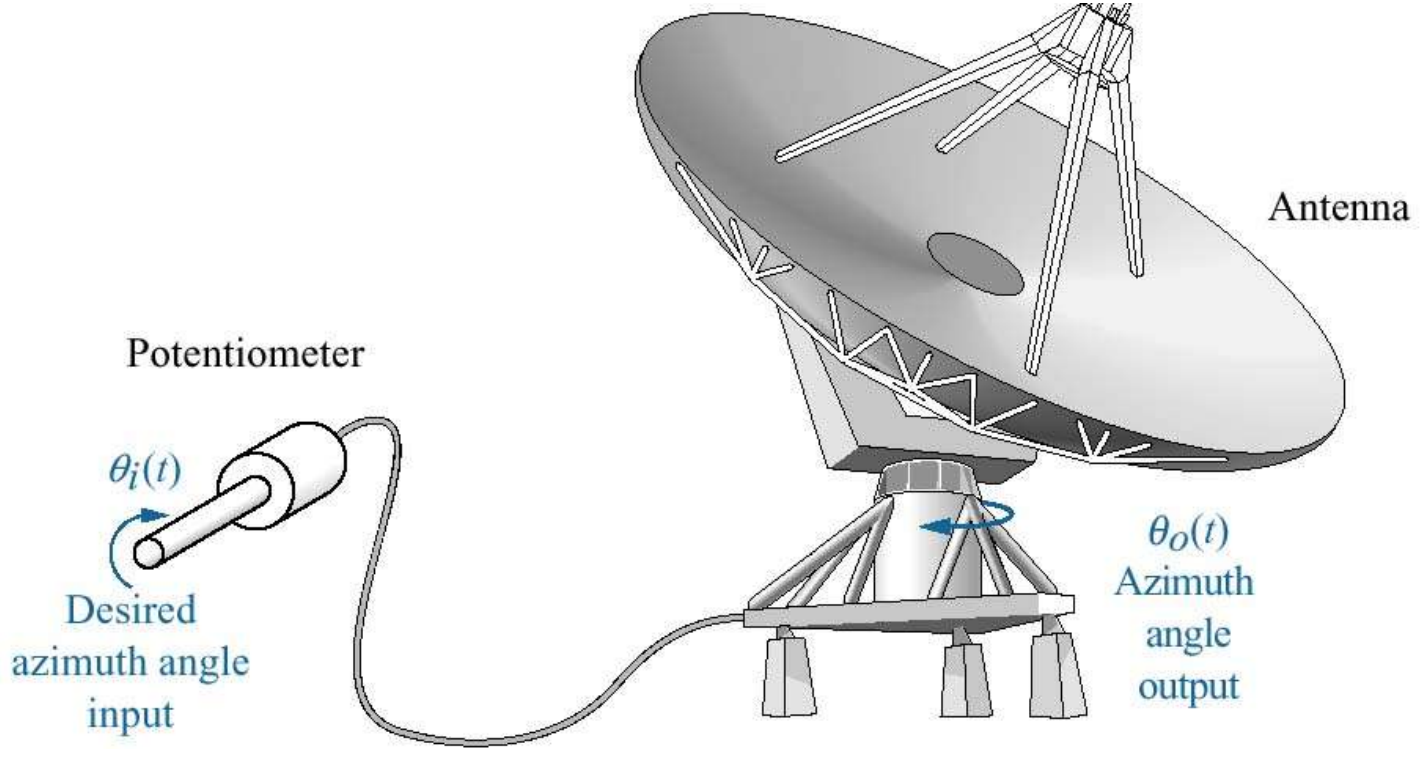


Analysis and Design Objectives

- Transient Response
- Steady-State Response
- Stability
- Sensibility

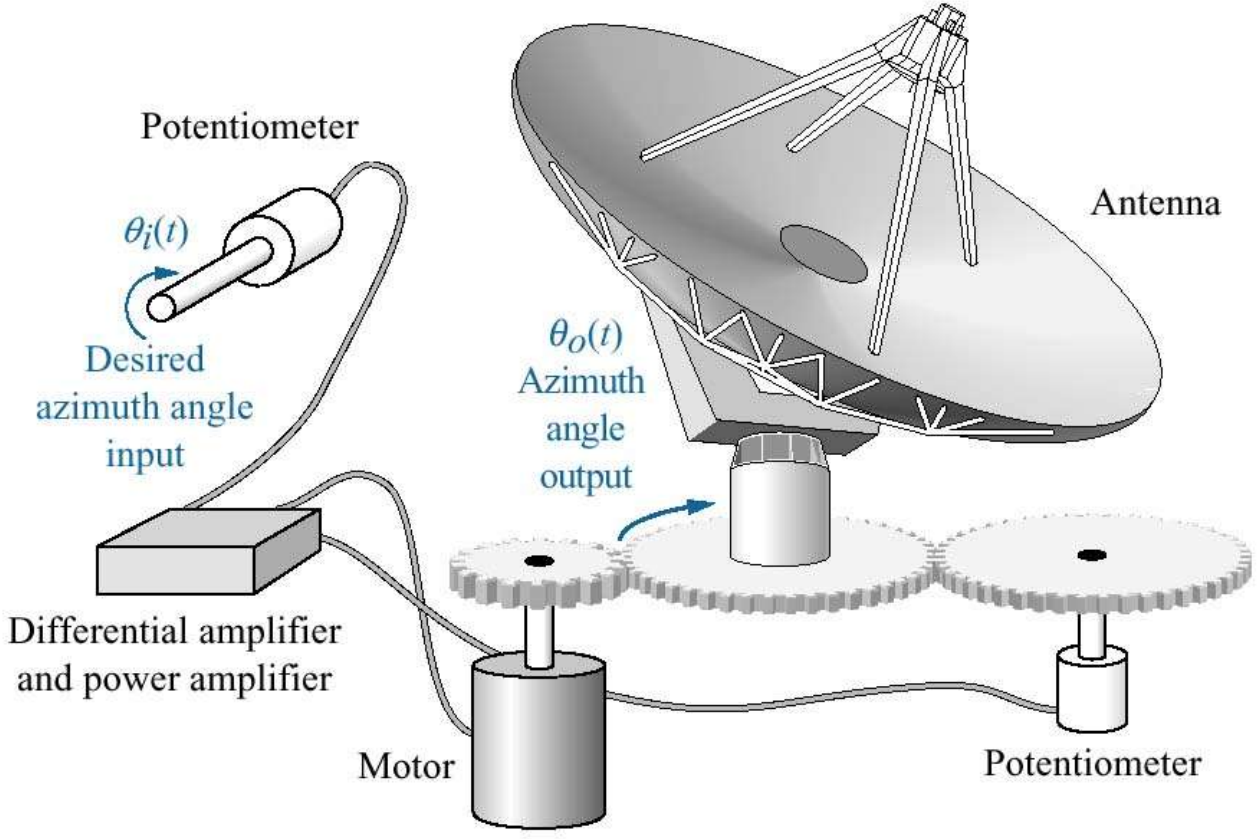
Computer hard disk drive, showing disks and read/write head

Antenna azimuth position control system



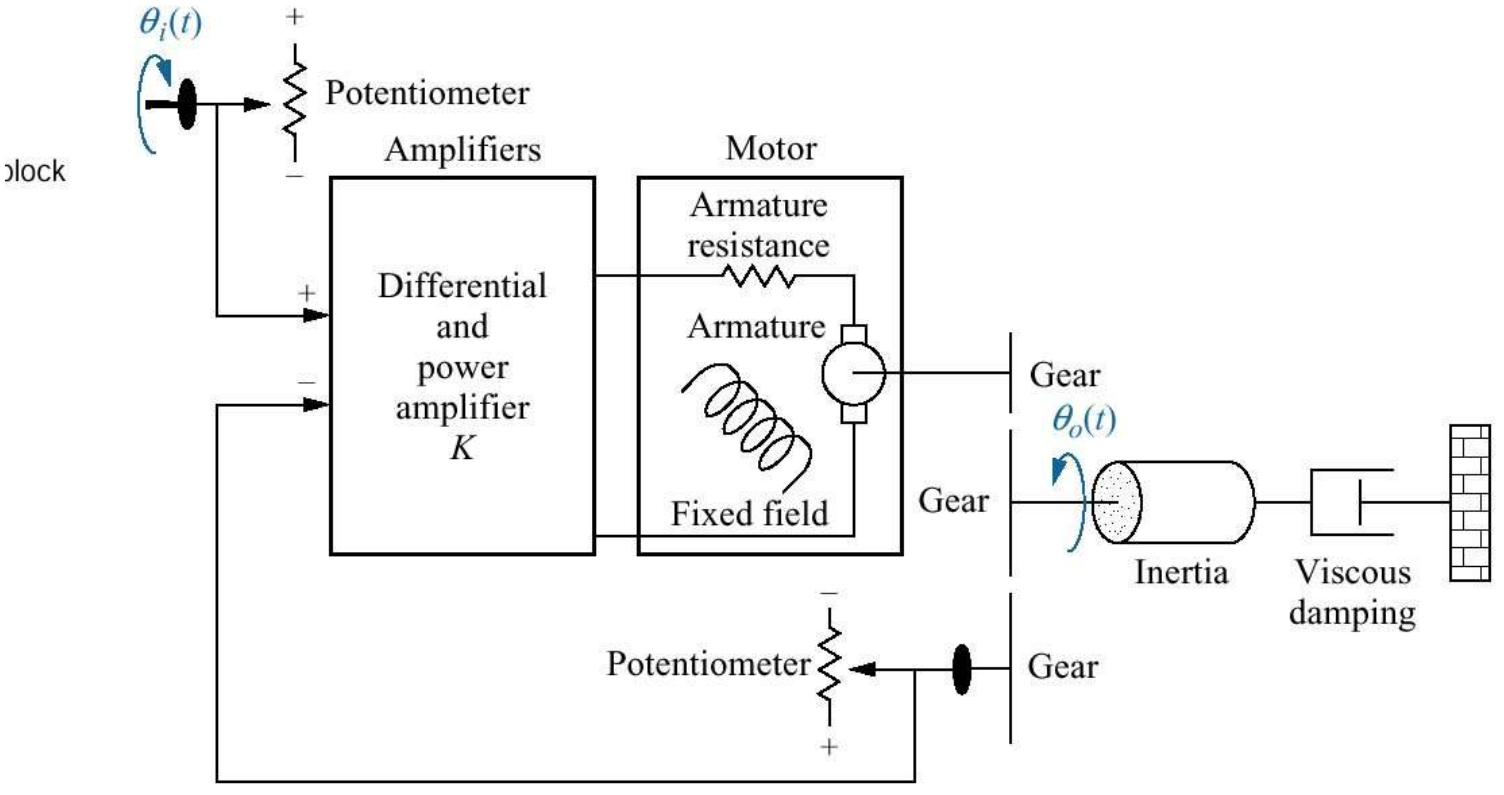
System concept

Antenna azimuth position control system



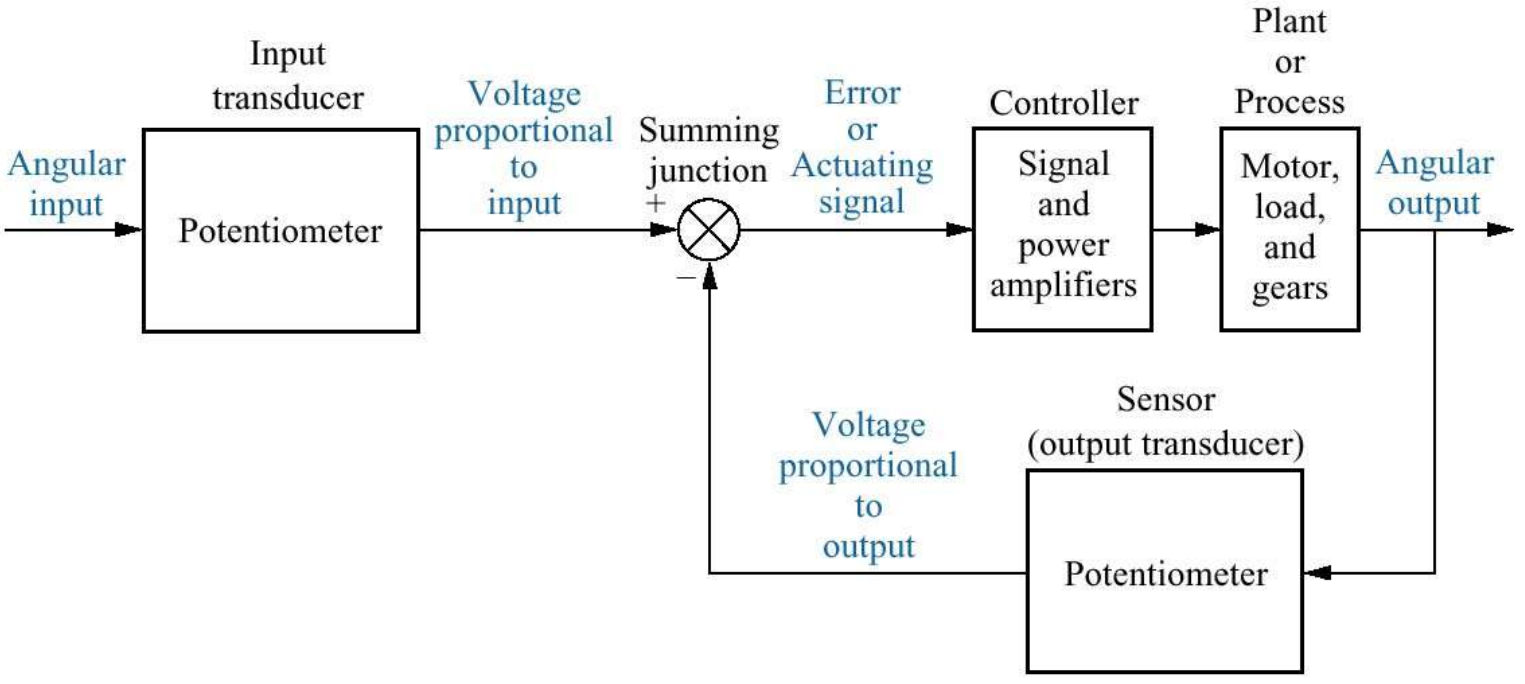
Detailed layout

Antenna azimuth position control system

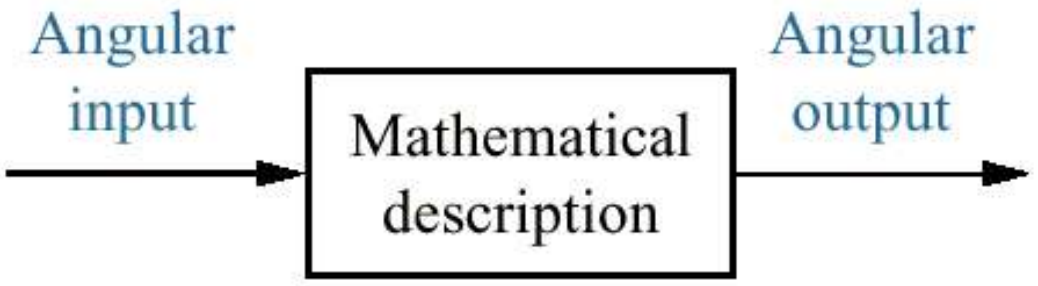


Schematic

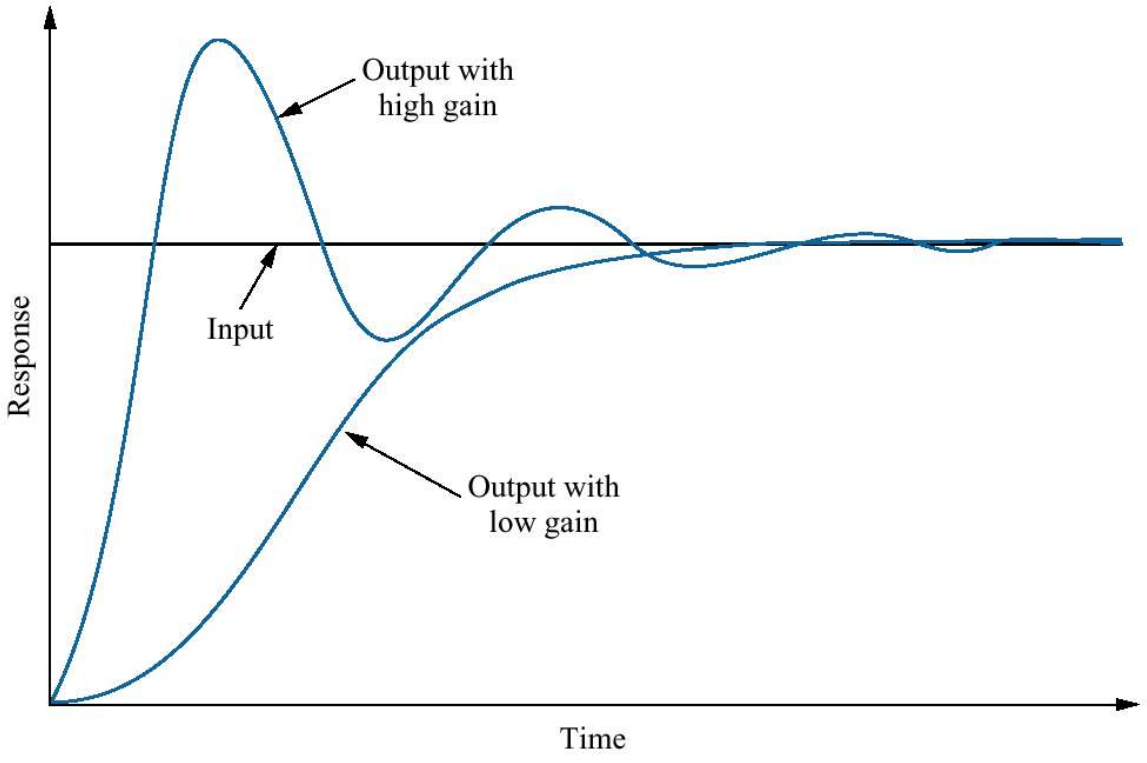
Antenna azimuth position control system



Functional block diagram

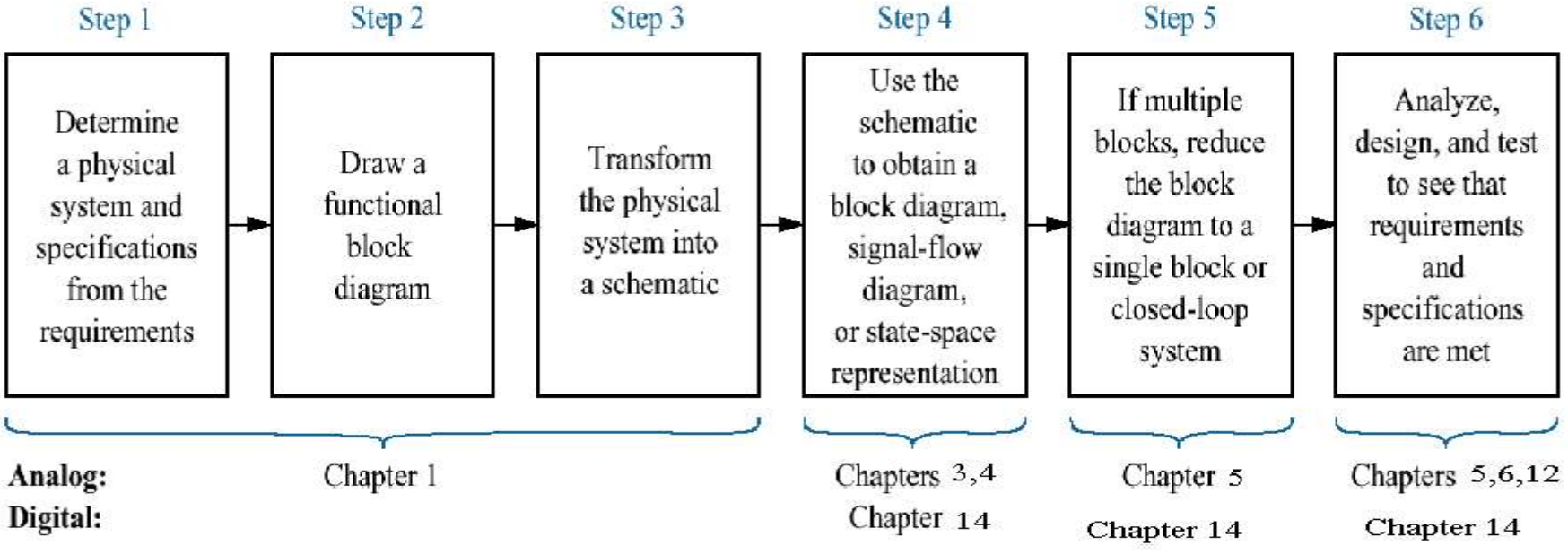


Equivalent block diagram for the antenna azimuth position control system



Response of a position control system showing effect of high and low controller gain on the output response

Control System Design Process



Design Tools

- Scilab
- Matlab
- etc.

Studying of Control Systems

- Signal and Systems

- Classic Control Systems
- Digital Control Systems
- Modern Control System

Studying of Control Systems

- Optimal Control
- Adaptive Control
- Robust Control
- Stochastic Control
- Identification
- Optimisation