

# Ch. 1 Introduction to Control System

## 1-1 Introduction

Centrifugal speed governor; James Watt, 18C Steam Engine

1922; Minorsky: 미분방정식으로부터 stability 결정

1932; Nyquist: open loop response for sinusoidal input -> closed loop stability

1934; Hazen: servo mechanism

1940~: frequency response method

~1950: root locus method; Evans

1950~: optimal control

single input single output (SISO) - classical

multiple input multiple output (MIMO) - modern; state space

optimal, adaptive, learning

### Definition

controlled variable (제어량) ; 측정되어서 제어되는 량

manipulated variable(control input); 제어량을 변화시키기 위하여 제어기에서 만들어진 량  
control; 제어량을 측정하여 측정값이 목표값(desired value)에 가까워지도록 함.

disturbance

feedback control

servo system; 출력이 위치, 속도, 가속도

process control system; 출력이 온도, 압력, 유량, 액위, pH

open loop

closed loop

linear system/non-linear system

principle of superposition

변수들의 작은 범위내에서 시스템을 선형화

time invariant/time varying system

continuous time/discontinuous time system

lumped parameter / distributed parameter system

ordinary differential eq./partial differential eq.

deterministic/stochastic system

## 1-2 Example

- governor

- robot arm control system

- temperature control system