FRT010: Automatic Control

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Notes written from Tore Hagglund lectures.

Contents

1 Introduction

1.1 Regulators

$e = r - y$ where

- r: reference signal (initial input)
- y: output signal
- u: input signal (step signal)

1.1.1 On-Off Regulator

$$u = \begin{cases} u_{max} & e \geq 0 \\ u_{min} & e < 0 \end{cases}$$

you can consider $K = \infty$

1.1.2 P-regulator

$$u = \begin{cases} u_{max} & e > e_0 \\ u_0 + K * e & e_0 \geq e \geq -e_0 \\ u_{min} & e < -e_0 \end{cases}$$

1.1.3 PI-regulator

$P : u = u_0 + K * e$
$PI : u = K(e + \frac{1}{T_i} \int_0^t e(t)dt)$
where T_i is the regulator's integral

1.1.4 PID-regulator

$u = K(e + \frac{1}{T_i} \int e dt + T_d \frac{de}{dt})$

1.2 Process Modelling

We can model our process with a differential eq?

$$\frac{d^n y}{dt^n} + a_1 \frac{d^{n-1} y}{dt^{n-1}} + \cdots = b_0 \frac{d^n u}{dt^n} + b_1 \frac{d^n u}{dt^{n-1}} + \ldots \tag{1}$$