Automatic Control
Laboratory practice 8

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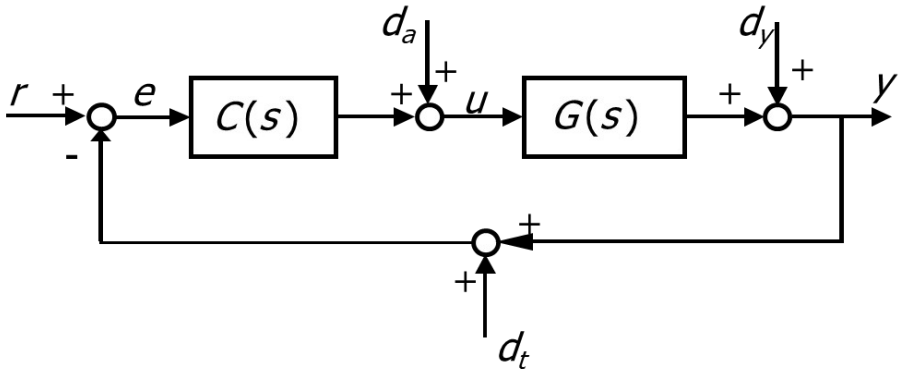
June 7, 2024

Objectives: Design of control systems

Problem 1

Objectives: loop shaping design

Let us consider the feedback control system:



where

$$G(s) = \frac{40}{(s^2 + 4s - 9.81)(1 + 0.001s)}.$$

Design a cascade controller $C(s)$ that meets the following requirements.

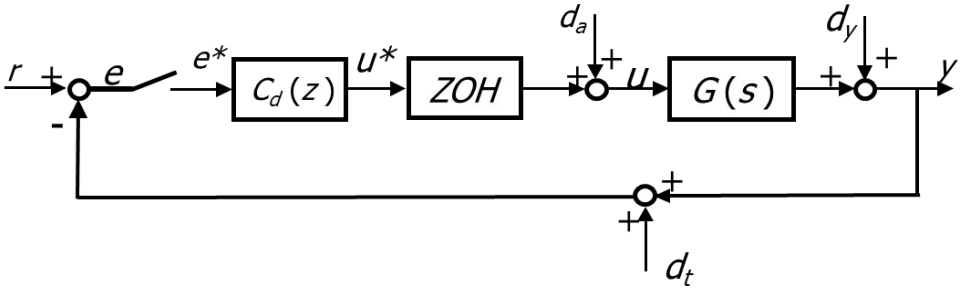
1. $|e_r^\infty| \leq 0.25$, $r(t) = 2t\varepsilon(t)$
2. $|y_{d_t}^\infty| \leq 0.01$, $d_t(t) = \delta_t \sin(\omega_t t)$, $|\delta_t| \leq 0.1$, $\omega_t \geq 90$ rad/s
3. $\widehat{S} \leq 20\%$

4. $t_r \leq 0.3$ s.

[INF] Problem 2

Objectives: digital control design through emulation

Let us consider the feedback control system:



where

$$G(s) = \frac{40}{s^2 + 4s - 9.81}.$$

Assume a sampling time $T_s = 0.02$ s. Design a digital controlled $C_d(z)$ that meets the following requirements.

1. $|e_r^\infty| \leq 0.25$, $r(t) = 2t\varepsilon(t)$
2. $|y_{d_t}^\infty| \leq 0.01, \quad d_t(t) = \delta_t \sin(\omega_t t), \quad |\delta_t| \leq 0.1, \quad \omega_t \geq 90$ rad/s.
3. $\widehat{S} \leq 20\%$
4. $t_r \leq 0.3$ s.