rldesign.exe Exercises for Chapter rldesign

Exercise rldesign.quixotism

Given the design methods we've learned, comment on how the **transient** response of a system with P-control differs with the inclusion of integral compensation.

Exercise rldesign.arval

How do P-, PI-, PD-, and PID-control affect a system's performance. (Limit your response to one sentence per controller.)

Exercise rldesign.17

Let a system have plant transfer function

$$\frac{10(s+20)}{(s+10)(s+4)(s+1)}. \quad (1)$$

Design a PD controller such that the closed-loop rise time is about 0.2 seconds and the overshoot is just under 25%.

Exercise rldesign.18

Let a system have plant transfer function

$$\frac{1}{s^3+22s^2+156s+232}. \quad (2)$$

Design a PID controller such that the closed-loop settling time is less than 0.5 seconds, the overshoot is less than 10%, and the steady-state error is zero for a step command.

Exercise rldesign.diurnation

Let a control system have the block diagram in Fig. exe.1, unity feedback $H(s) = 1$, and plant transfer function

$$G(s) = \frac{160}{s(s^2+16s+160)}. \quad (3)$$

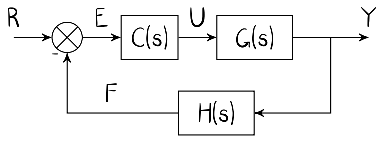

Figure exe.1: a block diagram with a controller C(s).

1. Design a PID controller $C(s)$ such that the closed-loop overshoot is less than 30%, peak time is close to 0.25 seconds, and the steady-state error is zero for a ramp command.
2. Demonstrate the controller performance by simulating and plotting both a step response and a ramp response.
3. Compute the simulated overshoot and peak time (via the step response).

Frequency response analysis