Lab 08: Digital control

CHEN4011: Advanced modeling and Control

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# 1. Objectives

1. To develop MATLAB Simulink model of continuous and digital control systems.
2. To simulate digital PI controller vs. continuous PI controller performance for different sampling periods T: 0.5, 1, 2.

# 2. Problem Statement

A continuous process is represented by the following transfer function:

$$G\_{p}\left(s\right)=\frac{5exp\left(−2s\right)}{\left(7s+1\right)\left(s+1\right)}  \left(1\right)$$

Also, an output disturbance transfer function is given by,

$$G\_{d}\left(s\right)=\frac{1.4exp\left(−3s\right)}{\left(10s+1\right)}  \left(2\right)$$

For the digital PI controller implementation, use zero-order hold and sampler where the sampling period can be varied as mentioned in the objectives.

# 3. Tasks

1. Develop a Simulink model that contains the continuous and digital control systems. Provide the screenshot of the Simulink model in the report. [2 marks]
2. Tune a PI controller for the continuous control system, e.g., using Control System Designer. [1 mark]
3. Apply the PI controller tuning in (b) to the continuous and digital systems. For the digital system, switch the continuous mode to the discrete mode. [2 marks]
4. Compare the performance of the digital PI controller for the 3 different sampling periods mentioned above with the continuous PI controller. Plot the responses and give comments on the results. [5 marks]