UM–SJTU Joint Institute

Signals and Systems

(VE216)

Laboratory Report

Lab 3

Feedback Control

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1. Objectives

- Understand feedback control

2. Theoretical Background

2.1. A Closed-Loop Feedback Model

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2.2. Closed-Loop Transfer Function

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To calculate $G_{\text{cl}}(s)$:

$$
\begin{aligned}
Y(s) &= E(s)C(s)P(s) \\
E(s) &= X(s) - H(s)Y(s) \\
G_{\text{cl}}(s) &= \frac{Y(s)}{X(s)} = \frac{C(s)P(s)}{1 + C(s)P(s)H(s)} \\
\frac{E(s)}{X(s)} &= \frac{1}{1 + C(s)P(s)H(s)}
\end{aligned}
$$

3. Experimental Procedures

3.1. Open-Loop System

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3.2. Feedback Control

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4. Experimental Results

4.1. Open-Loop System

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4.2. Feedback Control

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5. Error Analysis and Discussion

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6. Conclusion

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7. Reference

- Lab+3+Manual2024.pdf, UM-SJTU Joint Institute, 2024.