Topics covered in this presentation

- Block diagrams
- Effect of forward-path gain
- 5 representations of systems in state space
- Similarity transformations
- Eigenvalues and eigenvectors
5 Reduction of Multiple Subsystems

- 5.1 Introduction
- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations
5 Reduction of Multiple Subsystems

5.1 Introduction

- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations
5 Reduction of Multiple Subsystems

- 5.1 Introduction
- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations
Cascade form, [1, p. 237]

- **Equivalent TF**

\[ G_e(s) = G_3(s)G_2(s)G_1(s) \]

**Figure:** a. cascaded subsystems; b. equivalent TF
Parallel form, [1, p. 239]

- **Equivalent TF**

\[ G_e(s) = \pm G_3(s) \pm G_2(s) \pm G_1(s) \]

**Figure**: a. parallel subsystems; b. equivalent TF
5 Reduction of Multiple Subsystems

5.2 Block Diagrams

FB form, [1, p. 240]

- **OL TF**

  \[ G(s)H(s) \]

- **CL TF**

  \[ T(s) = \frac{G(s)}{1 \pm G(s)H(s)} \]

**Figure:** a. FB control system; b. simplified model; c. equivalent TF
Moving blocks to create familiar forms, [1, p. 241]

- **Summing junctions**

Figure: Block diagram algebra for summing junctions—equivalent forms for moving a block a. to the left past a summing junction; b. to the right past a summing junction.
5 Reduction of Multiple Subsystems

- 5.1 Introduction
- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations
5 Reduction of Multiple Subsystems

- 5.1 Introduction
- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations
5 Reduction of Multiple Subsystems

- 5.1 Introduction
- 5.2 Block Diagrams
- 5.3 Analysis and design of feedback systems
- 5.7 Alternative representations in state space
- 5.8 Similarity transformations