UESTC3001 Dynamics & Control
Lecture 2

Basics of Control System Analysis

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Outline

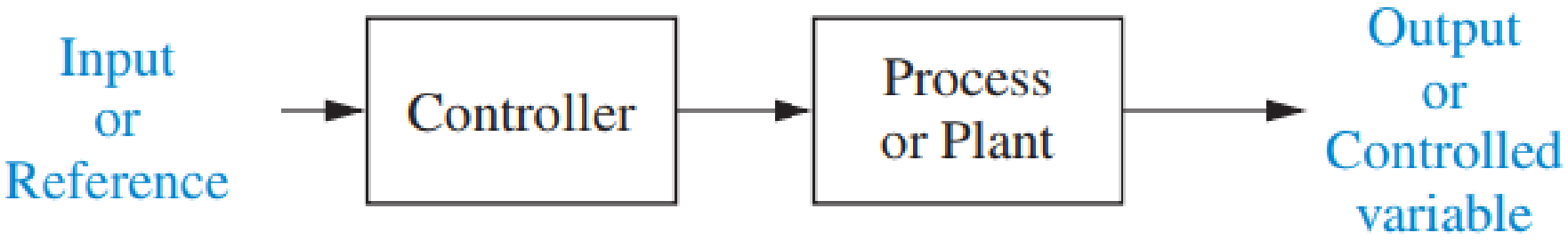
- Introduction to Control Systems
- Block Diagram Representation

Introduction to Control System

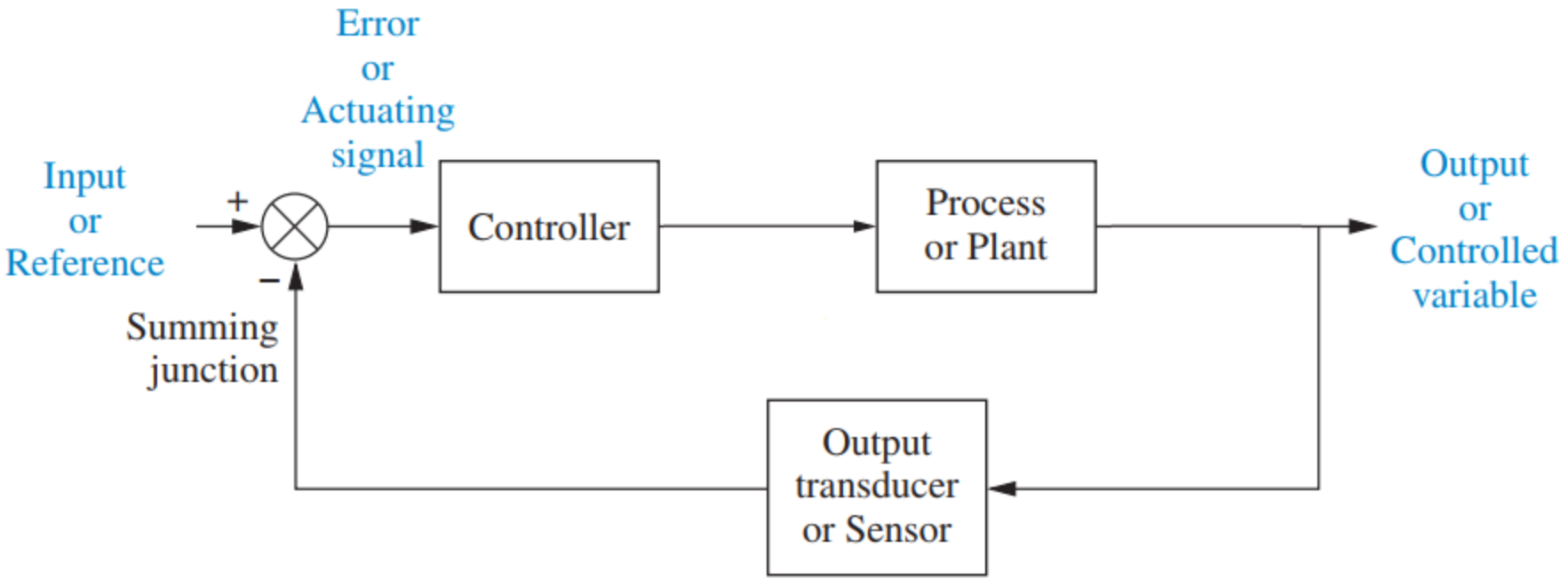
Advantages of Control Systems

- Power amplification
- Remote control
- Convenience of input form
- Compensation for disturbances

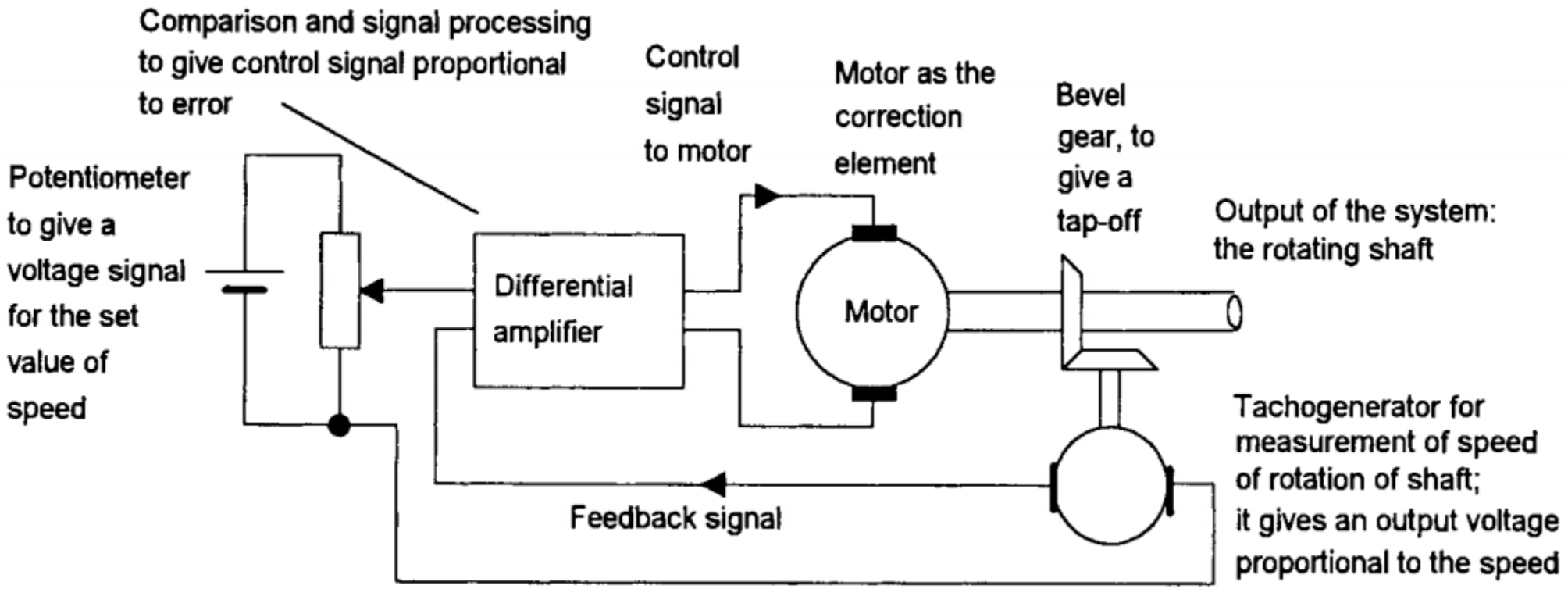
Open-loop Control



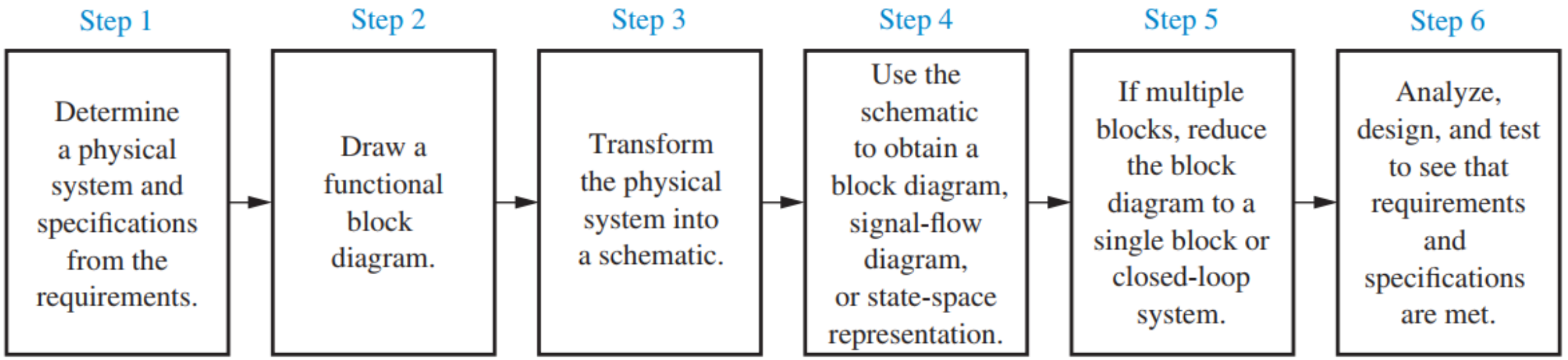
Closed-loop Control



Example
Control of the speed of rotation of a motor shaft



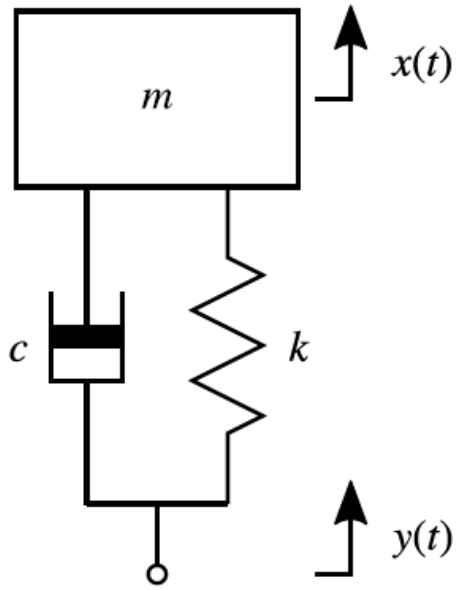
The Design Process



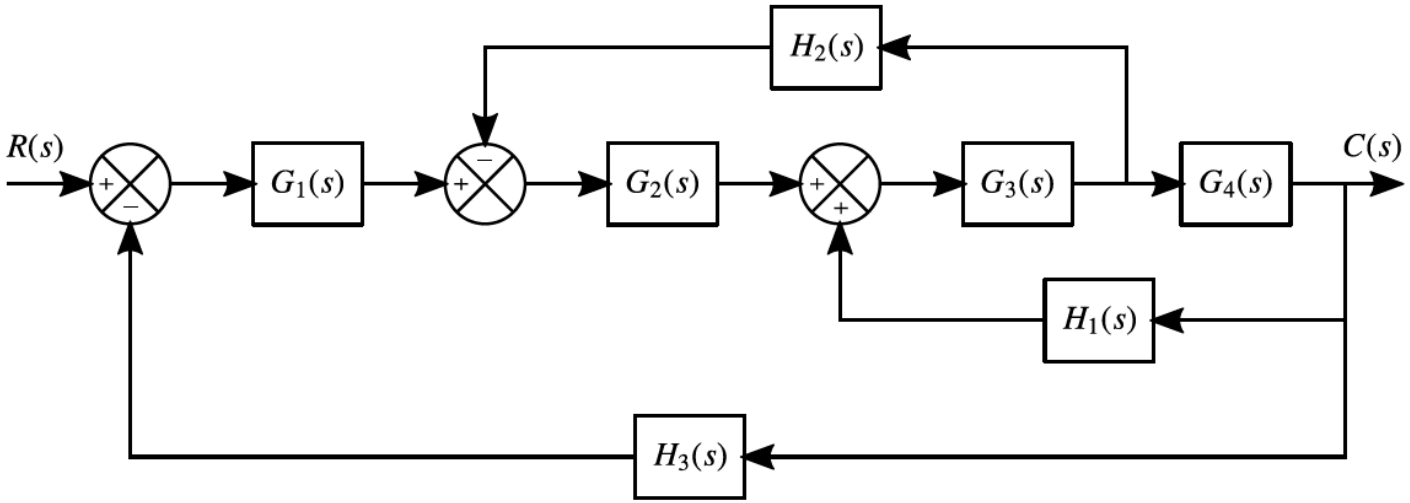
Introduction to Block Diagrams

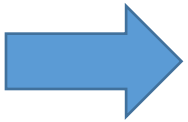
- Use for frequency-domain analysis and design
- Graphical representation of the interconnections between the components of the system and the flow of signals
- Diagram is composed of functional blocks

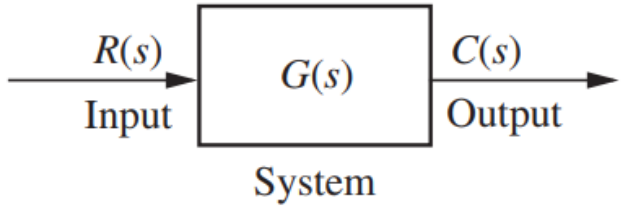
Example:
Block Diagram Representation of Control Systems



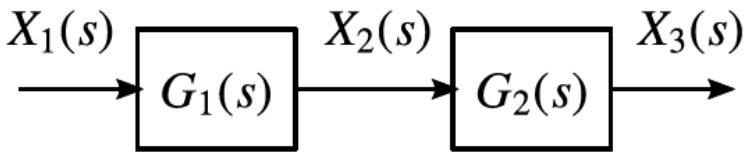
Block Diagram Reduction



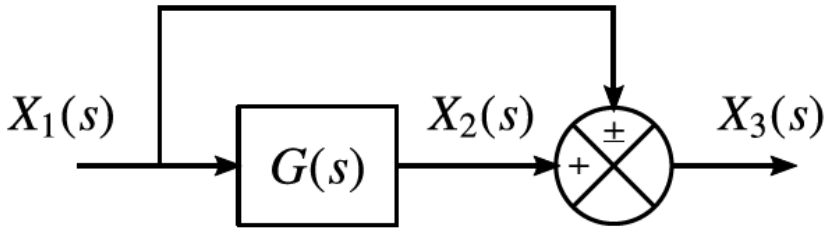




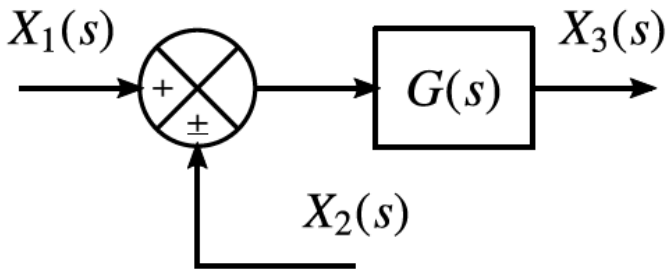
1: Cascaded Blocks



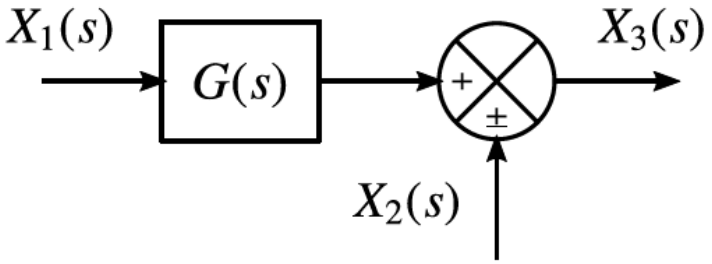
2: Summing Two Signals



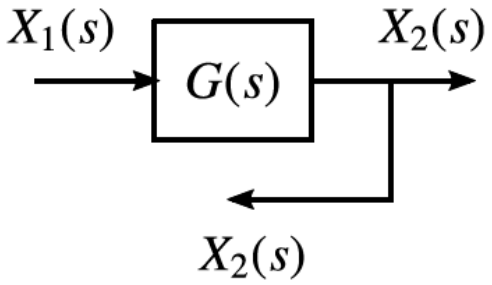
3: Moving a Summing Point Behind a Block



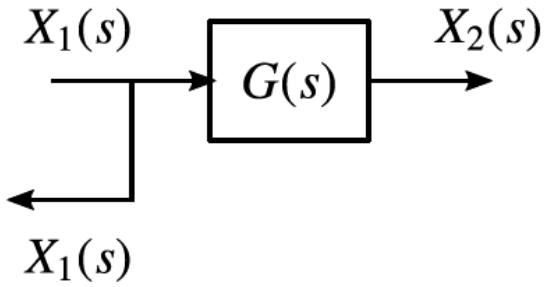
4: Moving a Summing Point Ahead of a Block



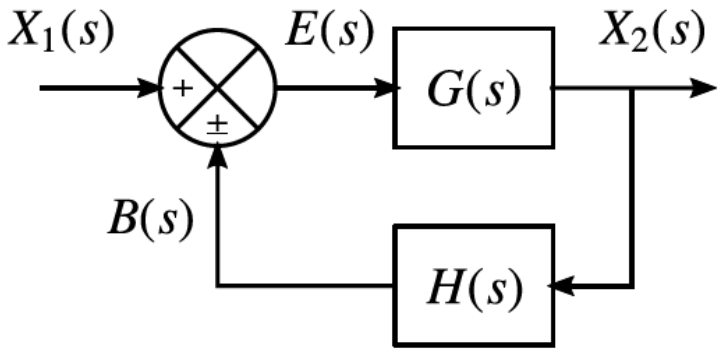
5: Moving a Branch Point Ahead of a Block



6: Moving a Branch Point Behind a Block



7: Eliminating a Feedback Loop



Summary

- Overview to Control Systems
- Block Diagram Representation of Control Systems
- Block Diagram Reduction
- Block Diagram Reduction Rules

Reference:

-Control Systems Engineering, 7th Edition, N.S. Nise
-UESTC3001 2019/20 Notes, J. Le Kernec