

Contents :

Front Matter

- Preface
- Acknowledgements
- Contents
- List of Figures
- Key Notation

Chapter 1 — Methods for Model Reduction

pp. 1–59

This chapter develops the principal techniques for reducing high-order mathematical models while controlling approximation error. The methods include:

- Balanced truncation
- Balanced realization
- Controllability and observability Gramians
- Hankel singular values
- Singular perturbation
- Modal truncation
- Hankel-norm approximation
- Error bounds
- Stability-preserving model reduction
- Continuous-time and discrete-time systems
- State-space and transfer-function descriptions

The book's publisher description specifically identifies **balanced truncation and Hankel norm reduction** among the principal reduction methods.

Chapter 2 — Multiplicative Approximation

pp. 61–91

Main subjects include:

- Multiplicative model approximation
- Approximation of transfer-function matrices
- Relative approximation error
- Frequency-domain approximation
- Weighted approximation
- Stability considerations
- Error bounds
- Hankel operators and Hankel norm
- Approximation of stable systems
- Reduced-order representations

Chapter 3 — Low Order Controller Design

pp. 93–128

Main subjects include:

- Low-order controller design
- Controller reduction
- Reduced-order controllers
- Controller approximation
- Closed-loop performance
- Stability of the reduced controller
- Error bounds associated with controller reduction
- Feedback control
- State-space controller representations
- Hankel-norm methods
- Weighted methods

This chapter is particularly concerned with reducing **controllers**, rather than only reducing the plant/model. Springer explicitly describes the book as covering both **filter and controller simplification** and notes that controller-reduction error bounds can be related to closed-loop properties.

Chapter 4 — Model and Controller Reduction Based on Coprime Factorizations

pp. 129–157

Main subjects include:

- Coprime factorization
- Coprime fractional descriptions
- Left and right coprime factorizations
- Stable coprime factors
- Model reduction using coprime factors
- Controller reduction using coprime factors
- Feedback stability
- Approximation error
- Reduced-order controller design
- Robustness of the closed-loop system

The Google Books index for this edition also identifies technical concepts such as **Bezout identity, coprime fractional descriptions, transfer-function matrices, Riccati equations, Hankel norm approximation, balanced truncation, controllability/observability Gramians and reduced-order controllers**.

Back Matter

- **Bibliography**, p. 159
- **Index**, p. 167

