



Approximation of Large-Scale Dynamical Systems (Advances in Design and Control)

Athanasios C. Antoulas

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Mathematical models are used to simulate, and sometimes control, the behavior of physical and artificial processes such as the weather and very large-scale integration (VLSI) circuits. The increasing need for accuracy has led to the development of highly complex models. However, in the presence of limited computational, accuracy, and storage capabilities, model reduction (system approximation) is often necessary. *Approximation of Large-Scale Dynamical Systems* provides a comprehensive picture of model reduction, combining system theory with numerical linear algebra and computational considerations. It addresses the issue of model reduction and the resulting trade-offs between accuracy and complexity. Special attention is given to numerical aspects, simulation questions, and practical applications. This book is for anyone interested in model reduction. Graduate students and researchers in the fields of system and control theory, numerical analysis, and the theory of partial differential equations/computational fluid dynamics will find it an excellent reference. Contents List of Figures; Foreword; Preface; How to Use this Book; Part I: Introduction. Chapter 1: Introduction; Chapter 2: Motivating Examples; Part II: Preliminaries. Chapter 3: Tools from Matrix Theory; Chapter 4: Linear Dynamical Systems: Part 1; Chapter 5: Linear Dynamical Systems: Part 2; Chapter 6: Sylvester and Lyapunov equations; Part III: SVD-based Approximation Methods. Chapter 7: Balancing and balanced approximations; Chapter 8: Hankel-norm Approximation; Chapter 9: Special topics in SVD-based approximation methods; Part IV: Krylov-based Approximation Methods; Chapter 10: Eigenvalue Computations; Chapter 11: Model Reduction Using Krylov Methods; Part V: SVD–Krylov Methods and Case Studies. Chapter 12: SVD–Krylov Methods; Chapter 13: Case Studies; Chapter 14: Epilogue; Chapter 15: Problems; Bibliography; Index.

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