Vector Lyapunov Functions and Stability Analysis of Nonlinear Systems 1st Edition

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Comparison Methods and Stability Theory

Wassim Haddad and VijaySekhar Chellaboina provide an exhaustive treatment of nonlinear systems theory and control using the highest standards of exposition and rigor. This graduate-level textbook goes well beyond standard treatments by developing Lyapunov stability theory, partial stability, boundedness, input-to-state stability, input-output stability, and stability theorems via vector Lyapunov functions. A differential equation is said to be stable if small changes in the initial conditions result in small changes in the solution. The Lyapunov Direct Method is a powerful tool for proving stability of solutions of differential equations.

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Energy Function Analysis for Power System Stability

W. L. Kling and G. A. Andersson provide a comprehensive treatment of the stability of large-scale electrical systems. This book covers the latest developments in the field, including the use of energy functions in the analysis of power system stability.

The problems of modern society are both complex and multidisciplinary. In spite of the apparent diversity of problems, tools developed in one context are often adaptable to an entirely different situation. The concepts of Lyapunov stability have significantly contributed to the development of tools that parallel these ideas in a wide range of applications. This collection of invited papers is intended to present recent advances in the field and to reflect the diversity of applications.

Formal Methods

The monograph is a comprehensive resource for the study of stability analysis in nonlinear systems. It provides a thorough and rigorous treatment of the subject, starting from the basics and progressing to advanced topics.

The study of nonlinear phenomena in aviation and aerospace includes developments in computer technology and the use of nonlinear mathematical models. Nonlinearities are a feature of aircraft dynamics and flight control systems and need to be accounted for in the design and analysis of systems. This monograph provides a comprehensive treatment of the stability analysis of nonlinear systems.

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Advances in Dynamic and Control 

Principles for large power networks as a tool for dynamic security assessment. It was therefore felt appropriate to capture the essential features of these advances and put them in a somewhat cohesive framework. The chapters in the book are based on five distinct areas:

1. Developing energy functions for structure-preserving models which can incorporate non-linear load models.
2. Energy functions to include detailed models of the generating unit, namely, the synchronous machine and the rest of the thermal plant.
3. Decentralized Control of Complex Systems.
4. Applications in the field of matrices in the computational solution of ordinary and partial differential equations, as well as important chapters on dynamic programming and stochastic matrices.
5. The book investigates stability theory in terms of two different measures, exhibiting the advantage of employing families of Lyapunov functions and treats the theory of a variety of inequalities, clearly bringing out the underlying theme. It also includes several excellent sets of exercises and many references to original papers containing further results. A discussion of the problem sections contains many useful and interesting results that are not easily found elsewhere.

Practical Stability Theory in the End of the 20th Century

The equations used to describe dynamic properties of physical systems are often nonlinear, and it is rarely possible to find their solutions. Although numerical solutions on digital and analog computers are not so useful for many types of systems, there are different dynamical methods that are useful regarding qualitative properties of nonlinear systems and their solutions: stability, long-term behavior of the system, bifurcation. These methods are not used in the control of systems, but can be used to answer questions relating to the qualitative properties of a system. This book discusses these methods and their application to control and stabilization.

Chaos and Complex Systems (CCS) is to bring together scientists, engineers, economists and social scientists, and to discuss the latest insights and results obtained in the areas of corresponding nonlinear-system complex (chaotic) behavior and not only in Chaos and Complex Systems (CCS) tsunami together, engineers, economists and social scientists, and to discuss the latest insights and results obtained in the area of corresponding nonlinear-system complex (chaotic) behavior. The book investigates stability theory in terms of two different measures, exhibiting the advantage of employing families of Lyapunov functions and treats the theory of a variety of inequalities, clearly bringing out the underlying theme. It also includes several excellent sets of exercises and many references to original papers containing further results. A discussion of the problem sections contains many useful and interesting results that are not easily found elsewhere.

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