Dynamical Systems Stability Theory And Applications Lecture Notes In Mathematics

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GWENDOLYN JAMARI

Stability Theory and Applications
CreateSpace
This book develops a general analysis and synthesis framework for impulsive and hybrid dynamical systems. Such a framework is imperative for modern complex engineering systems that involve interacting continuous-time and discrete-time dynamics with multiple modes of operation that place stringent demands on controller design and require implementation of increasing complexity--whether advanced high-performance tactical fighter aircraft and space vehicles, variable-cycle gas turbine engines, or air and ground transportation systems. Impulsive and Hybrid Dynamical Systems goes beyond similar treatments by developing invariant set stability theorems, partial stability, Lagrange stability, boundedness, ultimate boundedness, dissipativity theory, vector dissipativity theory, energy-based hybrid control, optimal control, disturbance rejection control, and robust control for nonlinear impulsive and hybrid dynamical systems. A major contribution to mathematical system theory and control system theory, this book is written from a system-theoretic point of view with the highest standards of exposition and rigor. It is intended for graduate students, researchers, and practitioners of engineering and applied mathematics

as well as computer scientists, physicists, and other scientists who seek a fundamental understanding of the rich dynamical behavior of impulsive and hybrid dynamical systems.

A Vector Dissipative Systems Approach

Dynamical Systems: Stability Theory and Applications

The second edition of this textbook provides a single source for the analysis of system models represented by continuous-time and discrete-time, finite-dimensional and infinite-dimensional, and continuous and discontinuous dynamical systems. For these system models, it presents results which comprise the classical Lyapunov stability theory involving monotonic Lyapunov functions, as well as corresponding contemporary stability results involving non-monotonic Lyapunov functions. Specific examples from several diverse areas are given to demonstrate the applicability of the developed theory to many important classes of systems, including digital control systems, nonlinear regulator systems, pulse-width-modulated feedback control systems, and artificial neural networks. The authors cover the following four general topics: - Representation and modeling of dynamical systems of the types described above - Presentation of Lyapunov and Lagrange stability theory for dynamical systems defined on general metric spaces involving monotonic and non-monotonic Lyapunov functions - Specialization of this stability theory to finite-dimensional dynamical

systems - Specialization of this stability theory to infinite-dimensional dynamical systems Replete with examples and requiring only a basic knowledge of linear algebra, analysis, and differential equations, this book can be used as a textbook for graduate courses in stability theory of dynamical systems. It may also serve as a self-study reference for graduate students, researchers, and practitioners in applied mathematics, engineering, computer science, economics, and the physical and life sciences. Review of the First Edition: “The authors have done an excellent job maintaining the rigor of the presentation, and in providing standalone statements for diverse types of systems. [This] is a very interesting book which complements the existing literature. [It] is clearly written, and difficult concepts are illustrated by means of good examples.” - Alessandro Astolfi, IEEE Control Systems Magazine, February 2009

Hybrid Dynamical Systems Springer Science & Business Media

"Illuminates the most important results of the Lyapunov and Lagrange stability theory for a general class of dynamical systems by developing topics in a metric space independantly of equations, inequalities, or inclusions. Applies the general theory to specific classes of equations. Presents new and expanded material on the stability analysis of hybrid dynamical systems and dynamical systems with discontinuous dynamics."

Stability and Motion Control Springer

Science & Business Media
Since their inception, the Perspectives in Logic and Lecture Notes in Logic series have published seminal works by leading logicians. Many of the original books in the series have been unavailable for years, but they are now in print once again. Stability theory was introduced and matured in the 1960s and 1970s. Today stability theory influences and is influenced by number theory, algebraic group theory, Riemann surfaces, and representation theory of modules. There is little model theory today that does not involve the methods of stability theory. In this volume, the fourth publication in the Perspectives in Logic series, Steven Buechler bridges the gap between a first-year graduate logic course and research papers in stability theory. The book prepares the student for research in any of today's branches of stability theory, and gives an introduction to classification theory with an exposition of Morley's Categoricity Theorem.
Bifurcation and Stability in Nonlinear Dynamical Systems CRC Press
Using the behavioural approach to mathematical modelling, this book views a system as a dynamical relation between manifest and latent variables. The emphasis is on dynamical systems that are represented by systems of linear constant coefficients. The first part analyses the structure of the set of trajectories generated by such dynamical systems, and derives the conditions for two systems of differential equations to be equivalent in the sense that they define the same behaviour. In

addition the memory structure of the system is analysed through state space models. The second part of the book is devoted to a number of important system properties, notably controllability, observability, and stability. In the third part, control problems are considered, in particular stabilisation and pole placement questions. Suitable for advanced undergraduate or beginning graduate students in mathematics and engineering, this text contains numerous exercises, including simulation problems, and examples, notably of mechanical systems and electrical circuits.

Stability, Dissipativity, and Control

John Wiley & Sons

Reprint of classic reference work. Over 400 books have been published in the series Classics in Mathematics, many remain standard references for their subject. All books in this series are reissued in a new, inexpensive softcover edition to make them easily accessible to younger generations of students and researchers. "... The book has many good points: clear organization, historical notes and references at the end of every chapter, and an excellent bibliography. The text is well-written, at a level appropriate for the intended audience, and it represents a very good introduction to the basic theory of dynamical systems."

The Stability of Dynamical Systems

Springer Science & Business Media

"Illuminates the most important results of the Lyapunov and Lagrange stability theory for a general class of dynamical

systems by developing topics in a metric space independantly of equations, inequalities, or inclusions. Applies the general theory to specific classes of equations. Presents new and expanded material on the stability analysis of hybrid dynamical systems and dynamical systems with discontinuous dynamics."

Stability Theory of Dynamical Systems Springer-Verlag

These notes are the result of a course in dynamical systems given at Orsay during the 1976-77 academic year. I had given a similar course at the Gradu ate Center of the City University of New York the previous year and came to France equipped with the class notes of two of my students there, Carol Hurwitz and Michael Maller. My goal was to present Smale's n-Stability Theorem as completely and compactly as possible and in such a way that the students would have easy access to the literature. I was not confident that I could do all this in lectures in French, so I decided to distribute lecture notes. I wrote these notes in English and Remi Langevin translated them into French. His work involved much more than translation. He consistently corrected for style, clarity, and accuracy. Albert Fathi got involved in reading the manuscript. His role quickly expanded to extensive rewriting and writing. Fathi wrote (5. 1) and (5. 2) and rewrote Theorem 7. 8 when I was in despair of ever getting it right with all the details. He kept me honest at all points and played a large role in the final form of the manuscript. He also did the

main work in getting the manuscript ready when I had left France and Langevin was unfortunately unavailable. I ran out of steam by the time it came to Chapter 10. M.

Dynamical Systems: Stability Theory and Applications Elsevier

An introduction to aspects of the theory of dynamical systems based on extensions of Liapunov's direct method. The main ideas and structure for the theory are presented for difference equations and for the analogous theory for ordinary differential equations and retarded functional differential equations.

Stability, Instability and Chaos Springer

This self-contained book provides systematic instructive analysis of uncertain systems of the following types: ordinary differential equations, impulsive equations, equations on time scales, singularly perturbed differential equations, and set differential equations. Each chapter contains new conditions of stability of unperturbed motion of the abo

Stability of Dynamical Systems Springer Nature

There are plenty of challenging and interesting problems open for investigation in the field of switched systems. Stability issues help to generate many complex nonlinear dynamic behaviors within switched systems. The authors present a thorough investigation of stability effects on three broad classes of switching mechanism: arbitrary switching where stability represents robustness to unpredictable

and undesirable perturbation, constrained switching, including random (within a known stochastic distribution), dwell-time (with a known minimum duration for each subsystem) and autonomously-generated (with a pre-assigned mechanism) switching; and designed switching in which a measurable and freely-assigned switching mechanism contributes to stability by acting as a control input. For each of these classes this book propounds: detailed stability analysis and/or design, related robustness and performance issues, connections to other control problems and many motivating and illustrative examples. Springer Science & Business Media Filling a gap in the literature, this volume offers the first comprehensive analysis of all the major types of system models. Throughout the text, there are many examples and applications to important classes of systems in areas such as power and energy, feedback control, artificial neural networks, digital signal processing and control, manufacturing, computer networks, and socio-economics. Replete with exercises and requiring basic knowledge of linear algebra, analysis, and differential equations, the work may be used as a textbook for graduate courses in stability theory of dynamical systems. The book may also serve as a self-study reference for graduate students, researchers, and practitioners in a huge variety of fields. **Nonlinear Dynamical Systems and Control** Princeton University Press Thought-provoking and accessible in

approach, this updated and expanded second edition of the Overview of Stability Theory Of Large Scale Dynamical Systems provides a user-friendly introduction to the subject, Taking a clear structural framework, it guides the reader through the subject's core elements. A flowing writing style combines with the use of illustrations and diagrams throughout the text to ensure the reader understands even the most complex of concepts. This succinct and enlightening overview is a required reading for advanced graduate-level students. We hope you find this book useful in shaping your future career. Feel free to send us your enquiries related to our publications to info@smpress.co.uk *Dynamical System* Springer Science & Business Media

Modern complex large-scale dynamical systems exist in virtually every aspect of science and engineering, and are associated with a wide variety of physical, technological, environmental, and social phenomena, including aerospace, power, communications, and network systems, to name just a few. This book develops a general stability analysis and control design framework for nonlinear large-scale interconnected dynamical systems, and presents the most complete treatment on vector Lyapunov function methods, vector dissipativity theory, and decentralized control architectures. Large-scale dynamical systems are strongly interconnected and consist of interacting subsystems exchanging matter, energy, or information with the environment. The

sheer size, or dimensionality, of these systems necessitates decentralized analysis and control system synthesis methods for their analysis and design. Written in a theorem-proof format with examples to illustrate new concepts, this book addresses continuous-time, discrete-time, and hybrid large-scale systems. It develops finite-time stability and finite-time decentralized stabilization, thermodynamic modeling, maximum entropy control, and energy-based decentralized control. This book will interest applied mathematicians, dynamical systems theorists, control theorists, and engineers, and anyone seeking a fundamental and comprehensive understanding of large-scale interconnected dynamical systems and control.

Modeling, Stability, and Robustness
Princeton University Press
Nonlinear Dynamical Systems and Control presents and develops an extensive treatment of stability analysis and control design of nonlinear dynamical systems, with an emphasis on Lyapunov-based methods. Dynamical system theory lies at the heart of mathematical sciences and engineering. The application of dynamical systems has crossed interdisciplinary boundaries from chemistry to biochemistry to chemical kinetics, from medicine to biology to population genetics, from economics to sociology to psychology, and from physics to mechanics to engineering. The increasingly complex nature of engineering systems requiring feedback control to obtain a desired

system behavior also gives rise to dynamical systems. 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, finite-time stability, semistability, stability of sets and periodic orbits, and stability theorems via vector Lyapunov functions. A complete and thorough treatment of dissipativity theory, absolute stability theory, stability of feedback systems, optimal control, disturbance rejection control, and robust control for nonlinear dynamical systems is also given. This book is an indispensable resource for applied mathematicians, dynamical systems theorists, control theorists, and engineers.

Global Stability of Dynamical Systems

CRC Press

The 11th International Workshop on Dynamics and Control brought together scientists and engineers from diverse fields and gave them a venue to develop a greater understanding of this discipline and how it relates to many areas in science, engineering, economics, and biology. The event gave researchers an opportunity to investigate ideas and techniq

Stability Theory and Applications

Springer Science & Business Media

Several distinctive aspects make

Dynamical Systems unique, including: treating the subject from a mathematical perspective with the proofs of most of the results included providing a careful review of background materials introducing ideas through examples and at a level accessible to a beginning graduate student

Stability, Symbolic Dynamics, and Chaos World Scientific

There has been much excitement over the emergence of new mathematical techniques for the analysis and control of nonlinear systems. In addition, great technological advances have bolstered the impact of analytic advances and produced many new problems and applications which are nonlinear in an essential way. This book lays out in a concise mathematical framework the tools and methods of analysis which underlie this diversity of applications.

Dynamical systems, stability theory and applications CRC Press

Hybrid dynamical systems exhibit continuous and instantaneous changes, having features of continuous-time and discrete-time dynamical systems. Filled with a wealth of examples to illustrate concepts, this book presents a complete theory of robust asymptotic stability for hybrid dynamical systems that is applicable to the design of hybrid control algorithms--algorithms that feature logic, timers, or combinations of digital and analog components. With the tools of modern mathematical analysis, Hybrid Dynamical Systems unifies and generalizes earlier developments in continuous-time and discrete-time

nonlinear systems. It presents hybrid system versions of the necessary and sufficient Lyapunov conditions for asymptotic stability, invariance principles, and approximation techniques, and examines the robustness of asymptotic stability, motivated by the goal of designing robust hybrid control algorithms. This self-contained and classroom-tested book requires standard background in mathematical analysis and differential equations or nonlinear systems. It will interest graduate students in engineering as well as students and researchers in control, computer science, and mathematics.

Dynamical Systems Princeton University Press

This book systematically presents a fundamental theory for the local analysis of bifurcation and stability of equilibriums in nonlinear dynamical systems. Until now, one does not have any efficient way to investigate stability and bifurcation of dynamical systems with higher-order singularity equilibriums. For instance, infinite-equilibrium dynamical systems have higher-order singularity, which dramatically changes dynamical behaviors and possesses the similar characteristics of discontinuous dynamical systems. The stability and bifurcation of equilibriums on the specific eigenvector are presented, and the spiral stability and Hopf bifurcation of equilibriums in nonlinear systems are presented through the Fourier series transformation. The bifurcation and

stability of higher-order singularity equilibriums are presented through the (2m)th and (2m+1)th -degree polynomial systems. From local analysis, dynamics of infinite-equilibrium systems is discussed. The research on infinite-equilibrium systems will bring us to the new era of dynamical systems and control. Presents an efficient way to investigate stability and bifurcation of dynamical systems with higher-order singularity equilibriums; Discusses dynamics of infinite-equilibrium systems; Demonstrates higher-order singularity.