Stability Instability And Chaos An Introduction T

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Global Bifurcations and Chaos Stephen Wiggins 2013-11-27 Global Bifurcations and Chaos: Analytical Methods is unique in the literature of chaos in that it not only defines the concept of chaos in deterministic systems, but it describes the mechanisms which give rise to chaos (i.e., homoclinic and heteroclinic motions) and derives explicit techniques whereby these mechanisms can be detected in specific systems. These techniques can be viewed as generalizations of Melnikov's method to multi-degree of freedom systems subject to slowly varying parameters and quasiperiodic excitations. A unique feature of the book is that each theorem is illustrated with drawings that enable the reader to build visual pictures of global dynamcis of the systems being described. This approach leads to an enhanced intuitive understanding of the theory.

Introduction to Control of Oscillations and Chaos Aleksandr L?vovich Fradkov 1998 This book gives an exposition of the exciting field of control of oscillatory and chaotic systems, which has numerous potential applications in mechanics, laser and chemical technologies, communications, biology and medicine, economics, ecology, etc.A novelty of the book is its systematic application of modern nonlinear and adaptive control theory to the new class of problems. The proposed control design methods are based on the concepts of Lyapunov functions, Poincare maps, speed-gradient and gradient algorithms. The conditions which ensure such control goals as an excitation or suppression of oscillations, synchronization and transformation from chaotic mode to the periodic one or vice versa, are established. The performance and robustness of control systems under disturbances and uncertainties are evaluated.The described methods and algorithms are illustrated by a number of examples, including classical models of oscillatory and chaotic systems: coupled pendula, brusselator, Lorenz, Van der Pol, Duffing, Henon and Chua systems. Practical

examples from different fields of science and technology such as communications, growth of thin films, synchronization of chaotic generators based on tunnel diods, stabilization of swings in power systems, increasing predictability of business-cycles are also presented.The book includes many results on nonlinear and adaptive control published previously in Russian and therefore were not known to the West.Researchers, teachers and graduate students in the fields of electrical and mechanical engineering, physics, chemistry, biology, economics will find this book most useful. Applied mathematicians and control engineers from various fields of technology dealing with complex oscillatory systems will also benefit from it.

Nonlinear Time Series Analysis with R Ray Huffaker 2017-10-20 Nonlinear Time Series Analysis with R provides a practical guide to emerging empirical techniques allowing practitioners to diagnose whether highly fluctuating and random appearing data are most likely driven by random or deterministic dynamic forces. It joins the chorus of voices recommending 'getting to know your data' as an essential preliminary evidentiary step in modelling. Time series are often highly fluctuating with a random appearance. Observed volatility is commonly attributed to exogenous random shocks to stable real-world systems. However, breakthroughs in nonlinear dynamics raise another possibility: highly complex dynamics can emerge endogenously from astoundingly parsimonious deterministic nonlinear models. Nonlinear Time Series Analysis (NLTS) is a collection of empirical tools designed to aid practitioners detect whether stochastic or deterministic dynamics most likely drive observed complexity. Practitioners become 'data detectives' accumulating hard empirical evidence supporting their modelling approach. This book is targeted to professionals and graduate students in engineering and the biophysical and social sciences. Its major objectives are to help non-mathematicians – with limited knowledge of nonlinear dynamics – to become operational in NLTS; and in this way to pave the way for NLTS to be adopted in the conventional empirical toolbox and core coursework of the targeted disciplines. Consistent with modern trends in university instruction, the book makes readers active learners with hands-on computer experiments in R code directing them through NLTS methods and helping them understand the underlying logic (please see www.marco.bittelli.com). The computer code is explained in detail so that readers can adjust it for use in their own work. The book also provides readers with an explicit framework – condensed from sound empirical practices recommended in the literature – that details a step-by-step procedure for applying NLTS in real-world data diagnostics.

Stability, Instability and Chaos Paul Glendinning 1994-11-25 An introduction to nonlinear differential equations which equips undergraduate students with the know-how to appreciate stability theory and bifurcation.

Application of New Cybernetics in Physics Oleg Kupervasser 2017-06-28 Application of New Cybernetics in Physics describes the application of new cybernetics to physical problems and the resolution of basic physical paradoxes by considering external observer influence. This aids the reader in solving

problems that were solved incorrectly or have not been solved. Three groups of problems of the new cybernetics are considered in the book: (a) Systems that can be calculated based on known physics of subsystems. This includes the external observer influence calculated from basic physical laws (ideal dynamics) and dynamics of a physical system influenced even by low noise. (b) Emergent systems. This includes external noise from the observer by using the black box model (complex dynamics), external noise from the observer by using the observer's intuition (unpredictable dynamics), defining boundaries of application of scientific methods for system behavior prediction, and the role of the observer's intuition for unpredictable systems. (c) Methods for solution of basic physical paradoxes by using methods of the new cybernetics: the entropy increase paradox, Schrödinger's cat paradox (wave package reduction in quantum mechanics), the black holes information paradox, and the time wormholes grandfather paradox. All of the above paradoxes have the same resolution based on the principles of new cybernetics. Indeed, even a small interaction of an observer with an observed system results in their time arrows' alignment (synchronization) and results in the paradox resolution and appearance of the universal time arrow. Provides solutions to the basic physical paradoxes and demonstrates their practical actuality for modern physics Describes a wide class of molecular physics and kinetic problems to present semi-analytical and semi-qualitative calculations of solvation, flame propagation, and high-molecular formation Demonstrates the effectiveness in application to complex molecular systems and other many-component objects Includes numerous illustrations to support the text

Set Theory And Its Applications In Physics And Computing Yair Shapira 2022-06-24 Why learn set theory? This book provides the answer – it is interesting, and also useful! Taking a new approach and looking from a fresh perspective, the discussion flows in a friendly and transparent way, supplemented with a lot of examples and figures. This makes the theory easily comprehensible: the proofs get vivid and visual, enveloped with interesting applications for students in (applied) math, physics, and engineering. Given the theory and the applications, the book could serve as a textbook in four (undergraduate) math courses: Introduction to set theory and its application; Chaos theory and stability – a geometrical point of view; Functional analysis – Han-Banach theory; and Cryptography with quantum computing. It teaches set theory from the basics, including the axiom of choice, the well ordering theorem, and Zorn's lemma. Furthermore, it uses Cantor's set to introduce chaos theory from a geometrical point of view. Moreover, it introduces the binomial formula (and other related formulas), and uses them in quantum statistical mechanics. And finally, it uses Zorn's lemma in functional analysis, general relativity, and quantum mechanics. There are also practical applications in cryptography, error correction, quantum computing and programming.

Semiconductor Lasers Junji Ohtsubo 2017-05-03 This book describes the fascinating recent advances made concerning the chaos, stability and instability of semiconductor lasers, and discusses their applications and future prospects in detail. It emphasizes the dynamics in semiconductor lasers

by optical and electronic feedback, optical injection, and injection current modulation. Applications of semiconductor laser chaos, control and noise, and semiconductor lasers are also demonstrated. Semiconductor lasers with new structures, such as vertical-cavity surface-emitting lasers and broad-area semiconductor lasers, are intriguing and promising devices. Current topics include fast physical number generation using chaotic semiconductor lasers for secure communication, development of chaos, quantum-dot semiconductor lasers and quantum-cascade semiconductor lasers, and vertical-cavity surface-emitting lasers. This fourth edition has been significantly expanded to reflect the latest developments. The fundamental theory of laser chaos and the chaotic dynamics in semiconductor lasers are discussed, but also for example the method of self-mixing interferometry in quantum-cascade lasers, which is indispensable in practical applications. Further, this edition covers chaos synchronization between two lasers and the application to secure optical communications. Another new topic is the consistency and synchronization property of many coupled semiconductor lasers in connection with the analogy of the dynamics between synaptic neurons and chaotic semiconductor lasers, which are compatible nonlinear dynamic elements. In particular, zero-lag synchronization between distant neurons plays a crucial role for information processing in the brain. Lastly, the book presents an application of the consistency and synchronization property in chaotic semiconductor lasers, namely a type of neuro-inspired information processing referred to as reservoir computing.

Complex Dynamics and Morphogenesis Chaouqi Misbah 2016-12-01 This book offers an introduction to the physics of nonlinear phenomena through two complementary approaches: bifurcation theory and catastrophe theory. Readers will be gradually introduced to the language and formalisms of nonlinear sciences, which constitute the framework to describe complex systems. The difficulty with complex systems is that their evolution cannot be fully predicted because of the interdependence and interactions between their different components. Starting with simple examples and working toward an increasing level of universalization, the work explores diverse scenarios of bifurcations and elementary catastrophes which characterize the qualitative behavior of nonlinear systems. The study of temporal evolution is undertaken using the equations that characterize stationary or oscillatory solutions, while spatial analysis introduces the fascinating problem of morphogenesis. Accessible to undergraduate university students in any discipline concerned with nonlinear phenomena (physics, mathematics, chemistry, geology, economy, etc.), this work provides a wealth of information for teachers and researchers in these various fields. Chaouqi Misbah is a senior researcher at the CNRS (National Centre of Scientific Research in France). His work spans from pattern formation in nonlinear science to complex fluids and biophysics. In 2002 he received a major award from the French Academy of Science for his achievements and in 2003 Grenoble University honoured him with a gold medal. Leader of a group of around 40 scientists, he is a member of the editorial board of the French Academy of Science since 2013 and also holds numerous national and international responsibilities.

Chaotic Dynamics in Nonlinear Theory Lakshmi Burra 2014-09-10 Using phase–plane analysis, findings from the theory of topological horseshoes and linked-twist maps, this book presents a novel method to prove the existence of chaotic dynamics. In dynamical systems, complex behavior in a map can be indicated by showing the existence of a Smale-horseshoe-like structure, either for the map itself or its iterates. This usually requires some assumptions about the map, such as a diffeomorphism and some hyperbolicity conditions. In this text, less stringent definitions of a horseshoe have been suggested so as to reproduce some geometrical features typical of the Smale horseshoe, while leaving out the hyperbolicity conditions associated with it. This leads to the study of the so-called topological horseshoes. The presence of chaos-like dynamics in a vertically driven planar pendulum, a pendulum of variable length, and in other more general related equations is also proved.

An Introduction to Ordinary Differential Equations James C. Robinson 2004-01-08 A first course in ordinary differential equations for mathematicians, scientists and engineers. Solutions are provided.

Mathematical Modeling Antonio Palacios 2022-09-19 This book provides qualitative and quantitative methods to analyze and better understand phenomena that change in space and time. An innovative approach is to incorporate ideas and methods from dynamical systems and equivariant bifurcation theory to model, analyze and predict the behavior of mathematical models. In addition, real-life data is incorporated in the derivation of certain models. For instance, the model for a fluxgate magnetometer includes experiments in support of the model. The book is intended for interdisciplinary scientists in STEM fields, who might be interested in learning the skills to derive a mathematical representation for explaining the evolution of a real system. Overall, the book could be adapted in undergraduate- and postgraduate-level courses, with students from various STEM fields, including: mathematics, physics, engineering and biology.

Nature-Inspired Computing: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources 2016-07-26 As technology continues to become more sophisticated, mimicking natural processes and phenomena also becomes more of a reality. Continued research in the field of natural computing enables an understanding of the world around us, in addition to opportunities for man-made computing to mirror the natural processes and systems that have existed for centuries. Nature-Inspired Computing: Concepts, Methodologies, Tools, and Applications takes an interdisciplinary approach to the topic of natural computing, including emerging technologies being developed for the purpose of simulating natural phenomena, applications across industries, and the future outlook of biologically and nature-inspired technologies. Emphasizing critical research in a comprehensive multi-volume set, this publication is designed for use by IT professionals, researchers, and graduate students studying intelligent computing.

Semiconductor Lasers Junji Ohtsubo 2007-12-10 This revised and updated edition of a highly relevant monograph describes fascinating recent progress in the

field of chaos, stability, and instability of semiconductor lasers. Applications and future prospects are discussed in detail. The book emphasizes the various dynamics induced in semiconductor lasers by optical and electronic feedback, optical injection, and injection current modulation. Recent results of both theoretical and experimental investigations are presented.

The Continuity of Mind Michael Spivey Professor of Psychology Cornell University 2008-06-30 The cognitive and neural sciences have been on the brink of a paradigm shift for over a decade. The traditional information-processing framework in psychology, with its computer metaphor of the mind, is still considered to be the mainstream approach, but dynamical-systems accounts of mental activity are now receiving a more rigorous treatment, allowing them to more beyond merely brandishing trendy buzzwords. The Continuity of the Mind will help to galvanize the forces of dynamical systems theory, cognitive and computational neuroscience, connectionism, and ecological psychology that are needed to complete this paradigm shift. In The Continuity of the Mind Michael Spivey lays bare the fact that comprehending a spoken sentence, understanding a visual scene, or just thinking about the days events involves the serial coalescing of different neuronal activation patterns, i.e., a state-space trajectory that flirts with a series of point attractors. As a result, the brain cannot help but spend most of its time instantiating patterns of activity that are in between identifiable mental states rather than in them. When this scenario is combined with the fact that most cognitive processes are richly embedded in their environmental context in real time, the state space (in which brief visitations of attractor basins are your thoughts) suddenly encompasses not just neuronal dimensions, but extends to biomechanical and environmental dimensions as well. As a result, your moment-by-moment experience of the world around you, even right now, can be described as a continuous trajectory through a high-dimensional state space that is comprised of diverse mental states. Spivey has arranged The Continuity of the Mind to present a systematic overview of how perception, cognition, and action are partially overlapping segments of one continuous mental flow, rather than three distinct mental systems. The initial chapters provide empirical demonstrations of the gray areas in mental activity that happen in between discretely labeled mental events, as well as geometric visualizations of attractors in state space that make the dynamical-systems framework seem less mathematically abstract. The middle chapters present scores of behavioral and neurophysiological studies that portray the continuous temporal dynamics inherent in categorization, language comprehension, visual perception, as well as attention, action, and reasoning. The final chapters conclude with discussions of what the mind itself must look like if its activity is continuous in time and its contents are distributed in state space.

Applications of Biophotonics and Nanobiomaterials in Biomedical Engineering Mohammad E. Khosroshahi 2017-10-30 This book provides a link between different disciplines of nanophysics, biophotonics, nanobiomaterials & applications of nanobiophotonics in biomedical research and engineering. The fundamentals of light, matter, nanobiomaterials & nanophysics are discussed together, and

relevant applications in biomedical engineering as well as other related factors influencing the interaction process are explicated. Theoretical and experimental research is combined, emphasizing the influence of crucial common factors on applications.

Deterministic Nonlinear Systems Vadim S. Anishchenko 2014-06-16 This text is a short yet complete course on nonlinear dynamics of deterministic systems. Conceived as a modular set of 15 concise lectures it reflects the many years of teaching experience by the authors. The lectures treat in turn the fundamental aspects of the theory of dynamical systems, aspects of stability and bifurcations, the theory of deterministic chaos and attractor dimensions, as well as the elements of the theory of Poincare recurrences.Particular attention is paid to the analysis of the generation of periodic, quasiperiodic and chaotic self-sustained oscillations and to the issue of synchronization in such systems. This book is aimed at graduate students and non-specialist researchers with a background in physics, applied mathematics and engineering wishing to enter this exciting field of research.

Surface Chaos and Its Applications Shu Tang Liu 2022 This book addresses a special topic in the field of nonlinear dynamical systems, develops a new research direction of surface chaos and surface bifurcation. It provides a clear watershed for original nonlinear chaos and bifurcation research. The novel content of this book makes nonlinear system research more systematical and personalized. This book introduces the chaos and bifurcation behavior of surface dynamics in the sense of Li Yorke, the basic properties, Lyapunov exponent and Feigenbaum constant of nonlinear behavior of surface, and obtained the wave behavior of chaotic process in surface motion, the control of surface chaos and bifurcation, and the wide application of surface chaos in engineering technology. Through this book, readers can obtain more abundant and novel contents about surface chaos and surface bifurcation than the existing mixed fitting bifurcation of plane curve and space curve, which can also expand the realm and vision of research.

Encyclopedia of Nonlinear Science Alwyn Scott 2006-05-17 In 438 alphabetically-arranged essays, this work provides a useful overview of the core mathematical background for nonlinear science, as well as its applications to key problems in ecology and biological systems, chemical reaction-diffusion problems, geophysics, economics, electrical and mechanical oscillations in engineering systems, lasers and nonlinear optics, fluid mechanics and turbulence, and condensed matter physics, among others.

Tipping Points John Bissell 2015-04-13 This book focuses on the modelling of contemporary health and social problems, especially those considered a major burden to communities, governments and taxpayers, such as smoking, alcoholism, drug use, and heart disease. Based on a series of papers presented at a recent conference hosted by the Leverhulme-funded Tipping Points project at the University of Durham, this book illustrates a broad range of modelling approaches. Such a diverse collection demonstrates that an interdisciplinary

approach is essential to modelling tipping points in health and social problems, and the assessment of associated risk and resilience.

From Collective Beings to Quasi-Systems Gianfranco Minati 2018-01-29 This book outlines a possible future theoretical perspective for systemics, its conceptual morphology and landscape while the Good-Old-Fashioned-Systemics (GOFS) era is still under way. The change from GOFS to future systemics can be represented, as shown in the book title, by the conceptual change from Collective Beings to Quasi-systems. With the current advancements, problems and approaches occurring in contemporary science, systemics are moving beyond the traditional frameworks used in the past. From Collective Beings to Coherent Quasi-Systems outlines a conceptual morphology and landscape for a new theoretical perspective for systemics introducing the concept of Quasi-systems. Advances in domains such as theoretical physics, philosophy of science, cell biology, neuroscience, experimental economics, network science and many others offer new concepts and technical tools to support the creation of a fully transdisciplinary General Theory of Change. This circumstance requires a deep reformulation of systemics, without forgetting the achievements of established conventions. The book is divided into two parts. Part I, examines classic systemic issues from new theoretical perspectives and approaches. A new general unified framework is introduced to help deal with topics such as dynamic structural coherence and Quasi-systems. This new theoretical framework is compared and contrasted with the traditional approaches. Part II focuses on the process of translation into social culture of the theoretical principles, models and approaches introduced in Part I. This translation is urgent in post-industrial societies where emergent processes and problems are still dealt with by using the classical or non-systemic knowledge of the industrial phase.

Elements of Mathematical Ecology Mark Kot 2001-07-19 An introduction to classical and modern mathematical models, methods, and issues in population ecology.

Classical And Quantum Mechanics With Lie Algebras Yair Shapira 2021-07-19 How to see physics in its full picture? This book offers a new approach: start from math, in its simple and elegant tools: discrete math, geometry, and algebra, avoiding heavy analysis that might obscure the true picture. This will get you ready to master a few fundamental topics in physics: from Newtonian mechanics, through relativity, towards quantum mechanics.Thanks to simple math, both classical and modern physics follow and make a complete vivid picture of physics. This is an original and unified point of view to highlighting physics from a fresh pedagogical angle.Each chapter ends with a lot of relevant exercises. The exercises are an integral part of the chapter: they teach new material and are followed by complete solutions. This is a new pedagogical style: the reader takes an active part in discovering the new material, step by step, exercise by exercise.The book could be used as a textbook in undergraduate courses such as Introduction to Newtonian mechanics and special relativity, Introduction to Hamiltonian mechanics and stability, Introduction to quantum physics and chemistry, and Introduction to Lie algebras with

applications in physics.

Remote Sensing of Turbulence Victor Raizer 2021-10-04 This book offers a unique multidisciplinary integration of the physics of turbulence and remote sensing technology. Remote Sensing of Turbulence provides a new vision on the research of turbulence and summarizes the current and future challenges of monitoring turbulence remotely. The book emphasizes sophisticated geophysical applications, detection, and recognition of complex turbulent flows in oceans and the atmosphere. Through several techniques based on microwave and optical/IR observations, the text explores the technological capabilities and tools for the detection of turbulence, their signatures, and variability. FEATURES Covers the fundamental aspects of turbulence problems with a broad geophysical scope for a wide audience of readers Provides a complete description of remote-sensing capabilities for observing turbulence in the earth’s environment Establishes the state-of-the-art remote-sensing techniques and methods of data analysis for turbulence detection Investigates and evaluates turbulence detection signatures, their properties, and variability Provides cutting-edge remote-sensing applications for space-based monitoring and forecasts of turbulence in oceans and the atmosphere This book is a great resource for applied physicists, the professional remote sensing community, ecologists, geophysicists, and earth scientists.

Instabilities, Chaos and Turbulence Paul Manneville 2010 This book (2nd edition) is a self-contained introduction to a wide body of knowledge on nonlinear dynamics and chaos. Manneville emphasises the understanding of basic concepts and the nontrivial character of nonlinear response, contrasting it with the intuitively simple linear response. He explains the theoretical framework using pedagogical examples from fluid dynamics, though prior knowledge of this field is not required. Heuristic arguments and worked examples replace most esoteric technicalities. Only basic understanding of mathematics and physics is required, at the level of what is currently known after one or two years of undergraduate training: elementary calculus, basic notions of linear algebra and ordinary differential calculus, and a few fundamental physical equations (specific complements are provided when necessary). Methods presented are of fully general use, which opens up ample windows on topics of contemporary interest. These include complex dynamical processes such as patterning, chaos control, mixing, and even the Earth's climate. Numerical simulations are proposed as a means to obtain deeper understanding of the intricacies induced by nonlinearities in our everyday environment, with hints on adapted modelling strategies and their implementation.

Nonlinear and Parametric Phenomena Vladimir Damgov 2004-11-22 The book comprises a broad panorama of phenomena occurring in four major classes of radiophysical and mechanical systems – linear, nonlinear, parametric, and nonlinear-parametric. An analytical technique for the broad circle of issues under consideration is developed. It is presented in a user-friendly form, allowing its further direct application in research practices. Analytical

methods are presented for investigating modulation-parametric and nonlinear systems, oscillating systems with periodic and almost periodic time-dependent parameters, effects of adaptive self-organization in coupled resonance systems and oscillating systems under the action of external forces, nonlinear with respect to the coordinates of excited systems. Of an interdisciplinary nature, this volume can serve as a handbook for developing lecture courses such as Fundamentals of Nonlinear Dynamics and Theory of Nonlinear Oscillations, Theory of Nonlinear Circuits and Systems, Fundamentals of Radiophysics and Electronics, Theory of Signals and Theoretical Radiophysics, Theoretical Mechanics and Electrodynamics. Contents:Principle of Reversibility of Modulation-Parametric InteractionsControlling Equivalent Impedances of Radiophysical SystemsNonlinear Resonance in Radiophysical Systems. Implementation of Parametric One-Ports. Peculiarities of the Utilization of Semiconductor Structures in Radiophysical SystemsChaotic Oscillations in Radiophysical SystemsElements of the Radiophysical SystemsOscillating Circuit with Constant ParametersGeneral Analysis of the Parametric Phenomena in Linear Oscillating Systems with Parameters Changing in TimeNonlinear Oscillating Systems with Parameters Changing in TimeGrouping of Coupled Oscillating Systems in Stable Electromechanical FormationsA Phenomenon of Excitation of Continuous Oscillations with a Discrete Set of Stable Amplitudes (“Quantized” Oscillation Excitation) Readership: Physicists and engineers. keywords: “This book ends with a ‘Conclusion’ section in which the author gives an excellent, concise summary of the results and issues examined in the volume and lists ‘a number of new research problems that can be subject to further scientific and research work’ … I do recommend it for purchase by research libraries, where it will provide a useful reference for those already well versed in the basic elements of nonlinear dynamic systems and those who require a good summary of important recent results in these areas.” SIAM Review

Bifurcations in Piecewise-smooth Continuous Systems David John Warwick Simpson 2010 Real-world systems that involve some non-smooth change are often well-modeled by piecewise-smooth systems. However there still remain many gaps in the mathematical theory of such systems. This doctoral thesis presents new results regarding bifurcations of piecewise-smooth, continuous, autonomous systems of ordinary differential equations and maps. Various codimension-two, discontinuity induced bifurcations are unfolded in a rigorous manner. Several of these unfoldings are applied to a mathematical model of the growth of Saccharomyces cerevisiae (a common yeast). The nature of resonance near border-collision bifurcations is described; in particular, the curious geometry of resonance tongues in piecewise-smooth continuous maps is explained in detail. NeimarkSacker-like border-collision bifurcations are both numerically and theoretically investigated. A comprehensive background section is conveniently provided for those with little or no experience in piecewise-smooth systems.

Guided Explorations of the Mechanics of Solids and Structures James F. Doyle 2009-09-21 This book provides a thoroughly modern approach to learning and understanding mechanics problems.

Hydrodynamic Instabilities François Charru 2011-06-30 The instability of fluid flows is a key topic in classical fluid mechanics because it has huge repercussions for applied disciplines such as chemical engineering, hydraulics, aeronautics, and geophysics. This modern introduction is written for any student, researcher, or practitioner working in the area, for whom an understanding of hydrodynamic instabilities is essential. Based on a decade's experience of teaching postgraduate students in fluid dynamics, this book brings the subject to life by emphasizing the physical mechanisms involved. The theory of dynamical systems provides the basic structure of the exposition, together with asymptotic methods. Wherever possible, Charru discusses the phenomena in terms of characteristic scales and dimensional analysis. The book includes numerous experimental studies, with references to videos and multimedia material, as well as over 150 exercises which introduce the reader to new problems.

Relational Methodologies and Epistemology in Economics and Management Sciences Biggiero, Lucio 2016-01-18 The social sciences, especially economics, management, and organizational science, are experiencing a tremendous renewed interest for their epistemological and methodological statutes, as witnessed by the many books and specialized journals established during the last two decades. Relational Methodologies and Epistemology in the Economics and Management Sciences identifies and presents the four main network-based methodologies including network analysis, Boolean network simulation modeling, artificial neural network simulation modeling, and agent-based simulation modeling in addition to their conceptual-epistemological implications and concrete applications within the social and natural sciences. Featuring a critical assessment of relational methodologies and their practical applications, this timely publication is ideal for use by corporate R&D departments, researchers, theorists, and graduate-level students.

Financial Markets and the Macroeconomy Carl Chiarella 2009-06-02 The financial instability and its spillover to the real sector have become a great challenge to macro-economic theory. The book takes a Keynesian theoretical perspective, representing an attempt to revive what Keynes stressed in his General Theory, namely the role of the financial market in macroeconomic outcomes. Although this book is inspired and motivated by the Asian currency and financial crises in the years 1997-8 and the experiences of the currently evolving U.S. financial disruptions, it also focuses on reviving a modeling tradition that provides a theoretical framework that throws light on recent financial market episodes and disturbances and their macroeconomic effects. It brings to the forefront, as Keynes has suggested, the role of financial market stability for growth and macroeconomics. It criticizes theories that see economic disruptions and shocks rooted solely in the real side of the economy. It stresses the financial real interaction as the major source for macroeconomic instability and disruptions. This important new book from a group of Keynesian, but nonetheless technically oriented economists would be of most interest to specialists and graduate students in macroeconomics and financial economics, especially those with an interest in US and European financial markets,

emerging market analysis, and dynamic economic modeling.

Harnessing Bistable Structural Dynamics Ryan L. Harne 2017-01-06 This book formulates and consolidates a coherent understanding of how harnessing the dynamics of bistable structures may enhance the technical fields of vibration control, energy harvesting, and sensing. Theoretical rigor and practical experimental insights are provided in numerous case studies. The three fields have received significant research interest in recent years, particularly in regards to the advantageous exploitation of nonlinearities. Harnessing the dynamics of bistable structures--that is, systems with two configurations of static equilibria--is a popular subset of the recent efforts. This book provides a timely consolidation of the advancements that are relevant to a large body of active researchers and engineers in these areas of understanding and leveraging nonlinearities for engineering applications. Coverage includes: Provides a one-source reference on how bistable system dynamics may enhance the aims of vibration control, energy harvesting, and sensing with a breadth of case studies Includes details for comprehensive methods of analysis, numerical simulation, and experimentation that are widely useful in the assessment of the dynamics of bistable structures Details approaches to evaluate, by analytical and numerical analysis and experiment, the influences of harmonic and random excitations, multiple degrees-of-freedom, and electromechanical coupling towards tailoring the underlying bistable system dynamics Establishes how intelligently utilizing bistability could enable technology advances that would be useful in various industries, such as automotive engineering, aerospace systems, microsystems and microelectronics, and manufacturing

Fuzzy Chaotic Systems Zhong Li 2006-08-02 This book presents the fundamental concepts of fuzzy logic and fuzzy control, chaos theory and chaos control. It also provides a definition of chaos on the metric space of fuzzy sets. The book raises many questions and generates a great potential to attract more attention to combine fuzzy systems with chaos theory. In this way it contains important seeds for future scientific research and engineering applications.

Systemics of Emergence Gianfranco Minati 2006 Within the General Systems Theory (GST) approach, it is possible to focus on "emergent" systemic properties (typically occurring in open, adaptive, anticipatory and chaotic systems), by stressing their specificity and their lack of reducibility into further components. In other words, emergence underlies the processes allowing the establishing of systemic properties. Research on emergence deals with experimental detection, modeling and simulation of processes giving rise to the occurrence of macroscopic (often complex and unexpected) behaviors in complex systems consisting of a large number of components. Actually such a theoretical and experimental effort relies on analytical methods, such as the ones used in modern theories of self-organization, collective-behaviors, phase transitions and artificial life. In sum, the research on emergence analyzes the engine of GST, while GST itself focuses on the general outcomes of this research, thus conceptually inducing an inter- and trans-disciplinary context. SYSTEMICS OF EMERGENCE: Research and Development is a volume devoted to exploring the core

theoretical and disciplinary research problems of emergence processes from which systems are established. It focuses on emergence as the key point of any systemic process. This topic is dealt with within different disciplinary approaches, indicated by the organization in sections: 1) Applications; 2) Biology and human care; 3) Cognitive Science; 4) Emergence; 5) General Systems; 6) Learning; 7) Management; 8) Social Systems; 9) Systemic Approach and Information Science; 10) Theoretical issues in Systemics. The Editors and contributing authors have produced this volume to help, encourage and widen the work in this area of General Systems Research.

Nonlinear Time Series Analysis Holger Kantz 2004 Sample Text

Computer Methods 2010-12-24 The combination of faster, more advanced computers and more quantitatively oriented biomedical researchers has recently yielded new and more precise methods for the analysis of biomedical data. These better analyses have enhanced the conclusions that can be drawn from biomedical data, and they have changed the way that experiments are designed and performed. This volume, along with the 2 previous Computer Methods volumes for the Methods in Enzymology serial, aims to inform biomedical researchers about recent applications of modern data analysis and simulation methods as applied to biomedical research. Presents step-by-step computer methods and discusses the techniques in detail to enable their implementation in solving a wide range of problems Informs biomedical researchers of the modern data analysis methods that have developed alongside computer hardware Presents methods at the "nuts and bolts" level to identify and resolve a problem and analyze what the results mean

Hydrobiological Modelling Brian J. Williams 2006 The book describes models of aquatic ecosystems, ranging from lakes to estuaries to the deep ocean. It provides a background in the physical and biological processes, numerical methods and elementary ecosystem models. It describes two of the most widely used hydrodynamic models and presents a number of case studies. The practice of modelling in management is discussed.

Monetary Macrodynamics Toichiro Asada 2012-11-12 This book investigates the interaction of effective goods demand with the wage-price spiral, and the impact of monetary policy on financial and the real markets from a Keynesian perspective. Endogenous business fluctuations are studied in the context of long-run distributive cycles in an advanced, rigorously formulated and quantitative setup. The material is developed by way of self-contained chapters on three levels of generality, an advanced textbook level, a research-oriented applied level and on a third level that shows how the interaction of real with financial markets has to be modelled from a truly integrative Keynesian perspective. Monetary Macrodynamics shows that the balanced growth path of a capitalist economy is unlikely to be attracting and that the cumulative forces that surround it are controlled in the large by changes in the behavioural factors that drive the wage-price spiral and the financial markets. Such behavioural changes can in fact be observed in actual economies in the

interaction of demand-driven business fluctuations with supply-driven wage and price dynamics as they originate from the conflict over income distribution between capital and labour. The book is a detailed critique of US mainstream macroeconomics and uses rigorous dynamic macro-models of a descriptive and applicable nature. It will be of particular relevance to postgraduate students and researchers interested in disequilibrium processes, real wage feedback channels, financial markets and portfolio choice, financial accelerator mechanisms and monetary policy.

Lotka-Volterra and Related Systems Shair Ahmad 2013-05-28 In recent years, there has been a tremendous amount of research activity in the general area of population dynamics, particularly the Lotka-Volterra system, which has been a rich source of mathematical ideas from both theoretical and application points of view. In spite of the technological advances, many authors seem to be unaware of the bulk of the work that has been done in this area recently. This often leads to duplication of work and frustration to the authors as well as to the editors of various journals. This book is built out of lecture notes and consists of three chapters written by four mathematicians with overlapping expertise that cover a broad sector of the research in this area. Each chapter consists of carefully written introductory exposition, main breakthroughs, open questions and bibliographies. The chapters present recent developments on topics involving the dynamic behavior of solutions and topics such as stability theory, permanence, persistence, extinction, existence of positive solutions for the Lotka-Volterra and related systems. This fills a void in the literature, by making available a source book of relevant information on the theory, methods and applications of an important area of research.

Maple in Mathematics Education and Research Jürgen Gerhard 2020-02-27 This book constitutes the refereed proceedings of the third Maple Conference, MC 2019, held in Waterloo, Ontario, Canada, in October 2019. The 21 revised full papers and 9 short papers were carefully reviewed and selected out of 37 submissions, one invited paper is also presented in the volume. The papers included in this book cover topics in education, algorithms, and applciations of the mathematical software Maple.

Handbook of Information and Communication Security Peter Stavroulakis 2010-02-23 At its core, information security deals with the secure and accurate transfer of information. While information security has long been important, it was, perhaps, brought more clearly into mainstream focus with the so-called “Y2K” issue. Te Y2K scare was the fear that c- puter networks and the systems that are controlled or operated by sofware would fail with the turn of the millennium, since their clocks could lose synchronization by not recognizing a number (instruction) with three zeros. A positive outcome of this scare was the creation of several Computer Emergency Response Teams (CERTs) around the world that now work - operatively to exchange expertise and information, and to coordinate in case major problems should arise in the modern IT environment. Te terrorist attacks of 11 September 2001 raised security concerns to a new level. Te - ternational community responded on at least two fronts; one front being

the transfer of reliable information via secure networks and the other being the collection of information about - tential terrorists. As a sign of this new emphasis on security, since 2001, all major academic publishers have started technical journals focused on security, and every major communi- tions conference (for example, Globecom and ICC) has organized workshops and sessions on security issues. In addition, the IEEE has created a technical committee on Communication and Information Security. Te ?rst editor was intimately involved with security for the Athens Olympic Games of 2004.