Dynamics And Control Of Switched Electronic Systems Advanced Perspectives For Modeling Simulation And Control Of Power Converters Advances In Industrial Control

Switched linear systems have enjoyed a particular growth in interest since the 1990s. The large amount of data and ideas thus generated have, until now, lacked a co-ordinating framework to focus them effectively on some of the fundamental issues such as the problems of robust stabilizing switching design, feedback stabilization and optimal switching. This deficiency is resolved by this book which features: nucleus of constructive design approaches based on canonical decomposition and forming a sound basis for the systematic treatment of secondary results; theoretical exploration and logical association of several independent but pivotal concerns in control design as they pertain to switched linear systems: controllability and observability, feedback stabilization, optimization and periodic switching; a reliable foundation for further theoretical research as well as design guidance for real life engineering applications through the integration of novel ideas, fresh insights and rigorous results.

This volume contains the proceedings of Analysis and Design of Hybrid Systems 2006: the 2nd IFAC Conference on Analysis and Design of Hybrid Systems, organized in Alghero (Italy) on June 7-9, 2006. ADHS is a series of triennial meetings that aims to bring together researchers and practitioners with a background in control and computer science to provide a survey of the advances in the field of hybrid systems, and of their ability to take up the challenge of analysis, design and verification of efficient and reliable control systems. ADHS'06 is the second Conference of this series after ADHS'03 in Saint Malo. 65 papers selected through careful reviewing process Plenary lectures presented by three distinguished speakers Featuring interesting new research topics

Modern dynamics was established many centuries ago by Galileo and Newton before the beginning of the industrial era. Presently, we are in the presence of the fourth industrial revolution, and mechanical systems are increasingly being integrated with electronic, electrical, and fluidic systems. This trend is present not only in the industrial environment, which will soon be characterized by the cyber-physical systems of industry 4.0, but also in other environments like mobility, health and bio-engineering, food and natural resources, safety, and sustainable living. In this context, purely mechanical systems with quasi-static behavior will become less common and the state-of-the-art will soon be represented by integrated mechanical systems, which need accurate dynamic models to predict their behavior. Therefore, mechanical system dynamics are going to play an increasingly central role. Significant research efforts are needed to improve the identification of the mechanical properties of systems in order to develop models that take non-linearity into account, and to develop efficient simulation tools. This Special Issue aims at disseminating the latest research achievements, findings, and ideas in mechanical systems dynamics, with particular emphasis on applications that are strongly integrated with other systems and require a multi-physical approach.

This book collates the information available on this topic, hitherto only to be found in journals and at conferences. It presents the fundamentals and advances in average and small–signal modeling of switched–mode converters, before applying this information to generate a real canonical converter model. Practical examples are scattered throughout the text, and experimental evidence is cited to support theoretical findings. The result is a solid basis for understanding and utilizing the dynamics of switched–mode converters — for the first time in their 40–year history.

This book presents up-to-date research and novel methodologies on fault diagnosis and fault

tolerant control for switched linear systems. It provides a unified yet neat framework of filtering, fault detection, fault diagnosis and fault tolerant control of switched systems. It can therefore serve as a useful textbook for senior and/or graduate students who are interested in knowing the state-of-the-art of filtering, fault detection, fault diagnosis and fault tolerant control areas, as well as recent advances in switched linear systems.

This book provides its reader with a good understanding of the stabilization of switched nonlinear systems (SNS), systems that are of practical use in diverse situations: design of fault-tolerant systems in space- and aircraft; traffic control; and heat propagation control of semiconductor power chips. The practical background is emphasized throughout the book; interesting practical examples frequently illustrate the theoretical results with aircraft and spacecraft given particular prominence. Stabilization of Switched Nonlinear Systems with Unstable Modes treats several different subclasses of SNS according to the characteristics of the individual system (time-varying and distributed parameters, for example), the state composition of individual modes and the degree and distribution of instability in its various modes. Achievement and maintenance of stability across the system as a whole is bolstered by trading off between individual modes which may be either stable or unstable or by exploiting areas of partial stability within all the unstable modes. The book can be used as a reference for academic research on switched systems or used by graduate students of control theory and engineering. Readers should have studied linear and nonlinear system theory and have some knowledge of switched and hybrid systems to get the most from this monograph.

The increased efficiency and quality constraints imposed on electrical energy systems have inspired a renewed research interest in the study of formal approaches to the analysis and control of power electronics converters. Switched systems represent a useful framework for modeling these converters and the peculiarities of their operating conditions and control goals justify the specific classification of "switched electronic systems". Indeed, idealized switched models of power converters introduce problems not commonly encountered when analyzing generic switched models or non-switched electrical networks. In that sense the analysis of switched electronic systems represents a source for new ideas and benchmarks for switched and hybrid systems generally. Dynamics and Control of Switched Electronic Systems draws on the expertise of an international group of expert contributors to give an overview of recent advances in the modeling, simulation and control of switched electronic systems. The reader is provided with a well-organized source of references and a mathematically-based report of the state of the art in analysis and design techniques for switched power converters. Intuitive language, realistic illustrative examples and numerical simulations help the reader to come to grips with the rigorous presentation of many promising directions of research such as: converter topologies and modulation techniques; continuous-time, discrete-time and hybrid models; modern control strategies for power converters; and challenges in numerical simulation. The guidance and information imparted in this text will be appreciated by engineers, and applied mathematicians working on system and circuit theory, control systems development, and electronic and energy conversion systems design.

The selected contributions of this book shed light on a series of interesting aspects related to nonlinear dynamics and synchronization with the aim of demonstrating some of their interesting applications in a series of selected disciplines. This book contains thirteenth chapters which are organized around five main parts. The first part (containing five chapters) does focus on theoretical aspects and recent trends of nonlinear dynamics and synchronization. The second part (two chapters) presents some modeling and simulation issues through concrete application examples. The third part (two chapters) is focused

on the application of nonlinear dynamics and synchronization in transportation. The fourth part (two chapters) presents some applications of synchronization in security-related system concepts. The fifth part (two chapters) considers further applications areas, i.e. pattern recognition and communication engineering. The International Conference on Intelligent Computing (ICIC) was formed to p-vide an annual forum dedicated to the emerging and challenging topics in artificial intelligence, machine learning, bioinformatics, and computational biology, etc. It aims to bring together researchers and practitioners from both academia and ind- try to share ideas, problems and solutions related to the multifaceted aspects of intelligent computing. ICIC 2008, held in Shanghai, China, September 15–18, 2008, constituted the 4th International Conference on Intelligent Computing. It built upon the success of ICIC 2007, ICIC 2006 and ICIC 2005 held in Qingdao, Kunming and Hefei, China, 2007, 2006 and 2005, respectively. This year, the conference concentrated mainly on the theories and methodologies as well as the emerging applications of intelligent computing. Its aim was to unify the picture of contemporary intelligent computing techniques as an integral concept that highlights the trends in advanced computational intelligence and bridges theoretical research with applications. Therefore, the theme for this conference was "Emerging Intelligent Computing Technology and Applications". Papers focusing on this theme were solicited, addressing theories, methodologies, and applications in science and technology.

A guide to the latest developments in grid dynamics and control and highlights the role of transmission and distribution grids Dynamics and Control of Electric Transmission and Microgrids offers a concise and comprehensive review of the most recent developments and research in grid dynamics and control. In addition, the authors present a new style of presentation that highlights the role of transmission and distribution grids that ensure the reliability and quality of electric power supply. The authors — noted experts in the field — offer an introduction to the topic and explore the basic characteristics and operations of the grid. The text also reviews a wealth of vital topics such as FACTS and HVDC Converter controllers, the stability and security issues of the bulk power system, loads which can be viewed as negative generation, the power limits and energy availability when distributed storage is used and much more. This important resource: Puts the focus on the role of transmission and distribution grids that ensure the reliability and quality of electric power supply Includes modeling and control of wind and solar energy generation for secure energy transfer Presents timely coverage of on-line detection of loss of synchronism, wide area measurements and applications, wide-area feedback control systems for power swing damping and microgrids-operation and control Written for students of power system dynamics and control/electrical power industry professionals, Dynamics and Control of Electric Transmission and Microgrids is a comprehensive guide to the recent developments in grid dynamics and control and highlights the role of transmission and distribution grids that ensure the

reliability and quality of electric power supply.

The Collection embraces Structural Dynamics and Renewable Energy into more than 50 categories, including Shock and Vibration, Damping in Solids, Nonlinear Modeling, Structural Health Modeling, Structural Dynamics, and Rotating Machinery. This the first volume of the five-volume set brings together 34 chapters on Structural Dynamics and Renewable Energy.

Before the Riders came to their remote valley the Yendri led a tranquil pastoral life. When the Riders conquered and enslaved them, only a few escaped to the forests. Rebellion wasn't the Yendri way; they hid, or passively resisted, taking consolation in the prophecies of their spiritual leader. Only one possessed the necessary rage to fight back: Gard the foundling, half-demon, who began a one-man guerrilla war against the Riders. His struggle ended in the loss of the family he loved, and condemnation from his own people. Exiled, he was taken as a slave by powerful mages ruling an underground kingdom. Bitterer and wiser, he found more subtle ways to earn his freedom. This is the story of his rise to power, his vengeance, his unlikely redemption and his maturation into a loving father--as well as a lord and commander of demon armies. Kage Baker, author of the popular and witty fantasy, The Anvil of the World, returns to that magical world for another story of love, adventure, and a fair bit of ironic humor. At the publisher's request, this title is being sold without Digital Rights Management software (DRM) applied.

The performance of most tasks with one hand, typically the right, is a uniquely human characteristic. Not only do people prefer to use one hand rather than the other, but also they usually perform tasks faster and more accurately with this hand. The study of manual asymmetries and what such performance differences between the two hands reveal about brain organization and motor function has been a topic of considerable research over the last several decades. The aim of this Research Topic is to review and further explore the origins of manual asymmetries and their relationship to handedness, unimanual and bimanual motor performance, and brain function. The articles included here involve original research conducted in humans or non-human models species, as well as theoretical perspectives, review articles, and meta-analyses.

Dynamics is a science concerned with movement and changes. In the most general approach it relates to life processes as well as behavior in nature in rest. It governs small particles, technical objects, conversion of matter and materials but also concerns people, groups of people in their individual and, in particular, social dimension. In dynamics we always have to do with causes or stimuli for motion, the rules of reaction or behavior and its result in the form of trajectory of changes. This book is devoted to dynamics of a wide class of specific but very important objects such as electromechanical systems. This is a very rigorous discipline and has a long tradition, as its theoretical bases were formulated in the first half of the XIX century by d' Alembert, Lagrange, Hamilton, Maxwell and other prominent scientists, but their crucial results were based on previous

pioneering research of others such as Copernicus, Galileo, Newton... This book in its theoretical foundations is based on the principle of least action which governs classical as well as relativistic mechanics and electromagnetism and leads to Lagrange's equations which are applied in the book as universal method to construct equations of motion of electromechanical systems. It gives common and coherent grounds to formulate mathematical models for all lumped parameters' electromechanical systems, which are vital in our contemporary industry and civilized everyday life. From these remarks it seems that the book is general and theoretical but in fact it is a very practical one concerning modern electrical drives in a broad sense, including electromechanical energy conversion, induction motor drives, brushless DC drives with a permanent magnet excitation and switched reluctance machines (SRM). And of course their control, which means shaping of their trajectories of motion using modern tools, their designed autonomy in keeping a track according to our programmed expectations. The problems presented in the book are widely illustrated by characteristics, trajectories, dynamic courses all computed by use of developed simulation models throughout the book. There are some classical subjects and the history of the discipline is discussed but finally all modern tools and means are presented and applied. More detailed descriptions follow in abstracts for the particular chapters. The author hopes kind readers will enjoy and profit from reading this book.

Consensus Tracking of Multi-agent Systems with Switching Topologies takes an advanced look at the development of multi-agent systems with continuously switching topologies and relay tracking systems with switching of agents. Research problems addressed are well defined and numerical examples and simulation results are given to demonstrate the engineering potential. The book is aimed at advanced graduate students in control engineering, signal processing, nonlinear systems, switched systems and applied mathematics. It will also be a core reference for control engineers working on nonlinear control and switched control, as well as mathematicians and biomedical engineering researchers working on complex systems. Discusses key applications and the latest advances in distributed consensus tracking methods Offers a clear and comprehensive overview on the recent development of multi-agent systems with switching topologies Offers graduate students and beginning engineers a core reference on complex systems analysis and cooperative control

This book constitues the refereed proceedings of the 6th International Workshop on Hybrid Systems: Computation and Control, HSCC 2003, held in Prague, Czech Republic, in April 2003. The 36 revised full papers presented were carefully reviewed and selected from 75 submissions. All current issues in hybrid systems are addressed including formal methods for analysis and control, computational tools, as well as innovative applications in various fields such as automotive control, the immune system, electrical circuits, operating systems, and human brains.

This book provides an overview of the current state of research on development and application of methods, algorithms, tools and systems associated with the studies on man-machine interaction. Modern machines and computer systems are designed not only to process information, but also to work in dynamic environment, supporting or even replacing human activities in areas such as business, industry, medicine or military. The interdisciplinary field of research on man-machine interactions focuses on broad range of aspects related to the ways in which human make or use computational artifacts, systems and infrastructure. This monograph is the fourth edition in the series and presents new concepts concerning analysis, design and evaluation of man-machine systems. The selection of high-quality, original papers covers a wide scope of research topics focused on the main problems and challenges encountered within rapidly evolving new forms of human-machine relationships. The presented material is structured into following sections: human-computer interfaces, robot, control, embedded and navigation systems, bio-data analysis and mining, biomedical signal processing, image and motion data processing, decision support and expert systems, pattern recognition, fuzzy systems, algorithms and optimisation, computer networks and mobile technologies, and data management systems. Over the past years, the appropriateness of Computational Intelligence (CI) techniques in modeling and optimization tasks pertaining to complex nonlinear dynamic systems has become indubitable, as attested by a large number of studies reporting on the successful application of CI models in nonlinear science (for example, adaptive control, signal processing, medical diagnostic, pattern formation, living systems, etc.). This volume summarizes the state-of-the-art of CI in the context of nonlinear dynamic systems and synchronization. Aiming at fostering new breakthroughs, the chapters in the book focus on theoretical, experimental and computational aspects of recent advances in nonlinear science intertwined with computational intelligence techniques. In addition, all the chapters have a tutorial-oriented structure.

In addition to the three main themes: chemical reactors, distillation columns, and batch processes this volume also addresses some of the new trends in dynamics and control methodology such as model based predictive control, new methods for identification of dynamic models, nonlinear control theory and the application of neural networks to identification and control. Provides a useful reference source of the major advances in the field.

Ch. 1. Generalized Hamiltonian systems / D. Cheng -- ch. 2. Continuous finite-time control / T. P. Leung and Y. Hong -- ch. 3. Local stabilization of nonlinear systems by dynamic output feedback / P. Chen and H. Qin -- ch. 4. Hybrid control for global stabilization of a class of systems / J. Zhao -- ch. 5. Robust and adaptive control of nonholonomic mechanical systems with applications to mobile robots / Y. M. Hu and W. Huo -- ch. 6. Introduction to chaos control and anti-control / G. Chen ... [et al.].

This book constitutes the refereed proceedings of the 5th International Workshop

on Hybrid Systems: Computation and Control, HSCC 2002, held in Stanford, California, USA, in March 2002. The 33 revised full papers presented were carefully reviewed and selected from 73 submissions. All current issues in hybrid systems are addressed including formal models and methods and computational representations, algorithms and heuristics, computational tools, and innovative applications.

Presents the latest results of both academic and industrial research in the control, modelling and dynamics of two of the most fundamental constituents of all chemical engineering plant. Includes contributions on fixed-bed, gas-phase and tubular reactors, thermal cracking furnaces and distillation columns, related to applications in all major areas of chemical engineering, including petrochemicals and bulk chemical manufacture. Contains 51 papers.

As the demand for electrical power increases, power systems are being operated closer to their stability limits than ever before. This text focuses on explaining and analysing the dynamic performance of such systems which is important for both system operation and planning. Placing emphasis on understanding the underlying physical principles, the book opens with an exploration of basic concepts using simple mathematical models. Building on these firm foundations the authors proceed to more complex models and algorithms. Features include: * Progressive approach from simplicity to complexity. * Detailed description of slow and fast dynamics. * Examination of the influence of automatic control on power system dynamics. * Stability enhancement including the use of PSS and Facts. * Advanced models and algorithms for power system stability analysis. Senior undergraduate, postgraduate and research students studying power systems will appreciate the authors' accessible approach. Also for electric utility engineers, this valuable resource examines power system dynamics and stability from both a mathematical and engineering viewpoint.

This book provides comprehensive and integrated approaches for rigid and flexible object assembly. It presents comparison studies with the available force-guided robotic processes and covers contact-state modeling, scheme control strategies, and position searching algorithms. Further, it includes experimental validations for different assembly situations, including those for the assembly of industrial parts taken from the automotive industry.

This book presents recent theoretical advances in the analysis and synthesis of discrete-time switched systems under the time-dependent switching scheme, including stability and disturbance attenuation performance analysis, control and filtering, asynchronous switching, finite-time analysis and synthesis, and reachable set estimation. It discusses time-scheduled technology, which can achieve a better performance and reduce conservatism compared with the traditional time-independent approach. Serving as a reference resource for researchers and engineers in the system and control community, it is also useful for graduate and undergraduate students interested in switched systems and their applications.

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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. This book offers its readers a detailed overview of the synthesis of switched systems, with a focus on switching stabilization and intelligent control. The problems investigated are not only previously unsolved theoretically but also of practical importance in many applications: voltage conversion, naval piloting and navigation and robotics, for example. The book considers general switched-system models and provides more efficient design methods to bring together theory and application more closely than was possible using classical methods. It also discusses several different classes of switched systems. For general switched linear systems and switched nonlinear systems comprising unstable subsystems, it introduces novel ideas such as invariant subspace theory and the time-scheduled Lyapunov function method of designing switching signals to stabilize the underlying systems. For some typical switched nonlinear systems affected by various complex dynamics, the book proposes novel design approaches based on intelligent control concepts. It is a useful source of up-to-date design methods and algorithms for researchers studying switched systems and graduate students of control theory and engineering. In addition, it is a valuable reference resource for practising engineers working in switched-system control design. Readers should have a basic knowledge of linear, nonlinear and switched systems.

Presents new, state-of-the-art sliding mode control (SMC) methodologies for uncertain parameter-switching hybrid systems Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems presentsnew, state-of-the-art sliding mode control (SMC) methodologies for uncertain parameter-switching hybrid systems (including Markovian jump systems, switched hybrid systems, singular systems, stochastic systems and time-delay systems). The first part of this book establishes a unified framework for SMC of Markovian jump singular systems and proposes new SMC methodologies based on the analysis results. In the second part, the problem of SMC of switched state-delayed hybrid systems is investigated, and finally the parallel theories and techniques that have been developed are extended to deal with switched stochastic hybrid systems. Solved problems with new approaches for analysis and synthesis of continuous- and discrete-time switched hybrid systems, (including stability analysis and stabilization, dynamic output feedback control,) are also included throughout. Presents new, state-of-the-art sliding mode control (SMC) methodologies for uncertain parameter-switching hybrid systems Provides a unified, systematic framework for handling SMC problems Introduces new concepts, models and techniques Includes solved problems throughout Robust control has been a topic of active research in the last three decades culminating in H_2/H_∞ and μ design methods followed by research on parametric robustness, initially motivated by Kharitonov's theorem, the extension to non-linear time delay systems, and other more recent methods. The two volumes of Recent Advances in Robust Control give a selective overview of recent theoretical developments and present selected application examples. The volumes comprise 39 contributions

covering various theoretical aspects as well as different application areas. The first volume covers selected problems in the theory of robust control and its application to robotic and electromechanical systems. The second volume is dedicated to special topics in robust control and problem specific solutions. Recent Advances in Robust Control will be a valuable reference for those interested in the recent theoretical advances and for researchers working in the broad field of robotics and mechatronics. This book is focused on the fundamental aspects of analysis, modeling and design of digital control loops around high-frequency switched-mode power converters in a systematic and rigorous manner Comprehensive treatment of digital control theory for power converters Verilog and VHDL sample codes are provided Enables readers to successfully analyze, model, design, and implement voltage, current, or multi-loop digital feedback loops around switched-mode power converters Practical examples are used throughout the book to illustrate applications of the techniques developed Matlab examples are also provided

This volume looks at the study of dynamical systems with discontinuities. Discontinuities arise when systems are subject to switches, decisions, or other abrupt changes in their underlying properties that require a 'non-smooth' definition. A review of current ideas and introduction to key methods is given, with a view to opening discussion of a major open problem in our fundamental understanding of what nonsmooth models are. What does a nonsmooth model represent: an approximation, a toy model, a sophisticated qualitative capturing of empirical law, or a mere abstraction? Tackling this question means confronting rarely discussed indeterminacies and ambiguities in how we define, simulate, and solve nonsmooth models. The author illustrates these with simple examples based on genetic regulation and investment games, and proposes precise mathematical tools to tackle them. The volume is aimed at students and researchers who have some experience of dynamical systems, whether as a modelling tool or studying theoretically. Pointing to a range of theoretical and applied literature, the author introduces the key ideas needed to tackle nonsmooth models, but also shows the gaps in understanding that all researchers should be bearing in mind. Mike Jeffrey is a researcher and lecturer at the University of Bristol with a background in mathematical physics, specializing in dynamics, singularities, and asymptotics.

The theory of switched systems is related to the study of hybrid systems, which has gained attention from control theorists, computer scientists, and practicing engineers. This book examines switched systems from a control-theoretic perspective, focusing on stability analysis and control synthesis of systems that combine continuous dynamics with switching events. It includes a vast bibliography and a section of technical and historical notes.