Fuzzy Sliding Mode Control And Observation Of Complex Dynamic Systems And Applicationschinese Edition

Proceedings of UASG 2019Automatic Control, Mechatronics and Industrial EngineeringFuzzy Reasoning in Information, Decision and Control SystemsAdvances in Sliding Mode ControlSliding Mode Control in Electro-Mechanical SystemsComputational IntelligenceApplications of Various Fuzzy Sliding Mode Controllers in Induction Motor DrivesAdaptive Fuzzy Sliding Mode Control for Vibration Suppression of a Rotating Carbon Nanotube-reinforced Composite BeamIntelligent and Fuzzy Techniques in Big Data Analytics and Decision MakingSliding Mode Control of Switching Power ConvertersFuzzy Sliding Mode Control for Cart Inverted Pendulum SystemSimulation and Experiment of Neural-network Fuzzy Sliding Mode Control for Leveling Control of Turbine Access SystemAn Introduction to Fuzzy ControlRobot Manipulator ControlAfro-European Conference for Industrial AdvancementFuzzy Sets and Systems - IFSA 2003Proportional–integral–derivative/fuzzy Sliding Mode Control for Suspension of Active Magnetic Bearing SystemIntelligent Control and AutomationAdvanced Sliding Mode Control for Mechanical SystemsDesign of H[infinity] ANFIS-Based Fuzzy Sliding Mode ControllerApplications of Sliding Mode ControlSliding Mode Control of Uncertain Parameter-Switching Hybrid SystemsApplications of Sliding Mode Control in Science and EngineeringSliding Mode Control Using MATLABAdvances and Applications in Sliding Mode Control systemsAutomatic Control, Mechatronics and Industrial EngineeringModel Based Fuzzy ControlFuzzy Sliding Mode Control Algorithm for Four Wheel Skid Steer VehicleInternational Conference on Mechanism Science and Control Engineering (MSCE 2014)2018 IEEE XXV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)Recent Advances in Sliding Modes: From Control to Intelligent MechatronicsIntelligent Computational Optimization in Engineering2014 International Conference on Mechanical Engineering and Automation (ICMEA2014)Active Control of Bidirectional Structural VibrationActive Structural Control with Stable Fuzzy PID TechniquesFuzzy Neural Networks for Real Time Control ApplicationsFuzzy Logic for the Applications to Complex SystemsRecent Developments in Sliding Mode Control1997 IEEE International Symposium on Computational Intelligence in Robotics and AutomationModeling, Identification and Control of Robots

Proceedings of UASG 2019

The sliding mode control paradigm has become a mature technique for the design of robust controllers for a wide class of systems including nonlinear, uncertain and time-delayed systems. This book is a collection of plenary and invited talks delivered at the 12th IEEE International Workshop on Variable Structure System held at the Indian Institute of Technology, Mumbai, India in January 2012. After the workshop, these researchers were invited to develop book chapters for this edited collection in order to reflect the latest results and open research questions in the area. The contributed chapters have been organized by the editors to reflect the various themes of sliding mode control which are the current areas of theoretical

research and applications focus; namely articulation of the fundamental underpinning theory of the sliding mode design paradigm, sliding modes for decentralized system representations, control of time-delay systems, the higher order sliding mode concept, results applicable to nonlinear and underactuated systems, sliding mode observers, discrete sliding mode control together with cutting edge research contributions in the application of the sliding mode concept to real world problems. This book provides the reader with a clear and complete picture of the current trends in Variable Structure Systems and Sliding Mode Control Theory.

Automatic Control, Mechatronics and Industrial Engineering

Great progresses have been made in the application of fuzzy set theory and fuzzy logic. Most remarkable area of application is 'fuzzy control', where fuzzy logic was first applied to plant control systems and its use is expanding to consumer products. Most of fuzzy control systems uses fuzzy inference with max-min or max-product composition, similar to the algorithm that first used by Mamdani in 1970s. Some algorithms are developed to refine fuzzy controls systems but the main part of algorithm stays the same. Triggered by the success of fuzzy control systems, other ways of applying fuzzy set theory are also investigated. They are usually referred to as 'fuzzy expert sys tems', and their purpose are to combine the idea of fuzzy theory with AI based approach toward knowledge processing. These approaches can be more generally viewed as 'fuzzy information processing', that is to bring fuzzy idea into informa tion processing systems.

Fuzzy Reasoning in Information, Decision and Control Systems

The book Applications of Various Fuzzy Sliding Mode Controllers in Induction Motor Drives contains publications on various fuzzy sliding mode speed controllers (FSMCs) based on the boundary layer approaches in the area of an indirect field-oriented control (IFOC) for Induction Motor (IM) drive, which include development and implementation FSMCs and related ?elds. The publications within Applications of Various Fuzzy Sliding Mode Controllers in Induction Motor Drives cover signi?cant and recent developments of both foundational and applicable character in the field. With the exception of some basic notions in sliding mode control (SMC), field-oriented control (FOC), and fuzzy theory, the book is completely self-contained. Important concepts in FSMCs and its use in high performance IM are carefully motivated and introduced. Specifically, the authors have excluded any technical material that does not contribute directly to the understanding of SMC, FOC or fuzzy theory. Many other excellent textbooks are available today that discuss fuzzy, FOC and SMC in much more technical detail than that which is provided here.

Advances in Sliding Mode Control

This book describes the advances and applications in Sliding mode control (SMC) which is widely used as a powerful method to tackle uncertain nonlinear systems. The book is organized into 21 chapters which have been organised by the editors to reflect the various themes of sliding mode control. The book provides the reader

with a broad range of material from first principles up to the current state of the art in the area of SMC and observation presented in a clear, matter-of-fact style. As such it is appropriate for graduate students with a basic knowledge of classical control theory and some knowledge of state-space methods and nonlinear systems. The resulting design procedures are emphasized using Matlab/Simulink software.

Sliding Mode Control in Electro-Mechanical Systems

This is the proceedings of the International Conference on Intelligent Computing, ICIC 2006, Kunming, China, August 2006. The book presents 165 revised full papers, carefully chosen and reviewed, organized in topical sections on fuzzy systems, fuzzy-neuro-evolutionary hybrids, supervised, unsupervised and reinforcement learning, intelligent agent and Web applications, intelligent fault diagnosis, natural language processing and expert systems, natural language human-machine interface using artificial neural networks, and intelligent financial engineering.

Computational Intelligence

Apply Sliding Mode Theory to Solve Control Problems Interest in SMC has grown rapidly since the first edition of this book was published. This second edition includes new results that have been achieved in SMC throughout the past decade relating to both control design methodology and applications. In that time, Sliding Mode Control (SMC) has continued to gain increasing importance as a universal design tool for the robust control of linear and nonlinear electro-mechanical systems. Its strengths result from its simple, flexible, and highly cost-effective approach to design and implementation. Most importantly, SMC promotes inherent order reduction and allows for the direct incorporation of robustness against system uncertainties and disturbances. These qualities lead to dramatic improvements in stability and help enable the design of high-performance control systems at low cost. Written by three of the most respected experts in the field, including one of its originators, this updated edition of Sliding Mode Control in Electro-Mechanical Systems reflects developments in the field over the past decade. It builds on the solid fundamentals presented in the first edition to promote a deeper understanding of the conventional SMC methodology, and it examines new design principles in order to broaden the application potential of SMC. SMC is particularly useful for the design of electromechanical systems because of its discontinuous structure. In fact, where the hardware of many electromechanical systems (such as electric motors) prescribes discontinuous inputs, SMC becomes the natural choice for direct implementation. This book provides a unique combination of theory, implementation issues, and examples of real-life applications reflective of the authors' own industry-leading work in the development of robotics, automobiles, and other technological breakthroughs.

Applications of Various Fuzzy Sliding Mode Controllers in Induction Motor Drives

Gathering 20 chapters contributed by respected experts, this book reports on the

latest advances in and applications of sliding mode control in science and engineering. The respective chapters address applications of sliding mode control in the broad areas of chaos theory, robotics, electrical engineering, physics, chemical engineering, memristors, mechanical engineering, environmental engineering, finance, and biology. Special emphasis has been given to papers that offer practical solutions, and which examine design and modeling involving new types of sliding mode control such as higher order sliding mode control, terminal sliding mode control, super-twisting sliding mode control, and integral sliding mode control. This book serves as a unique reference guide to sliding mode control and its recent applications for graduate students and researchers with a basic knowledge of electrical and control systems engineering.

Adaptive Fuzzy Sliding Mode Control for Vibration Suppression of a Rotating Carbon Nanotube-reinforced Composite Beam

Engineering technology development and implementation play an important role in making the industry more sustainable in an increasingly competitive world. This book covers significant recent developments in both fundamental and applied research in the engineering field. Domains of application include, but are not limited to, Intelligent Control Systems and Optimization, Signal Processing, Sensors, Systems Modeling and Control, Robotics and Automation, Industrial and Electric Engineering, Production and Management. This book is an excellent reference work to get up to date with the latest research and developments in the fields of Automation, Mechatronics and Industrial Engineering. It aims to provide a platform for researchers and professionals in all relevant fields to gain new ideas and establish great achievements in scientific development.

Intelligent and Fuzzy Techniques in Big Data Analytics and Decision Making

Fuzzy controllers are a class of knowledge based controllers using artificial intelligence techniques with origins in fuzzy logic to compute an appropriate control action. These fuzzy knowledge based controllers can be found either as stand-alone control elements or as integral parts of distributed control systems including conventional controllers in a wide range of industrial process control systems and consumer products. Applications of fuzzy controllers have become a well established practice for Japanese manufacturers of control equipment and systems, and are becoming more and more common for their European and American counterparts. The main aim of this book is to show that fuzzy control is not totally ad hoc, that there exist formal techniques for the analysis of a fuzzy controller, and that fuzzy control can be implemented even when no expert knowledge is available. Thus the book is mainly oriented toward control engineers and theorists rather than fuzzy and non-fuzzy AI people. However, parts can be read without any knowledge of control theory and may be of interest to AI people. The book has six chapters. Chapter 1 introduces two major classes of knowledge based systems for closedloop control. Chapter 2 introduces relevant parts of fuzzy set theory and fuzzy logic. Chapter 3 introduces the principal design parameters of a fuzzy knowledge based controller (FKBC) and discusses their relevance with respect to its performance. Chapter 4 considers an FKBC as a particular type of

nonlinear controller. Chapter 5 considers tuning and adaptation of FKBCs, which are nonlinear and so can be designed to cope with a certain amount of nonlinearity. Chapter 6 considers several approaches for stability analysis of FKBCs in the context of classical nonlinear dynamic systems theory.

Sliding Mode Control of Switching Power Converters

AN INDISPENSABLE RESOURCE FOR ALL THOSE WHO DESIGN AND IMPLEMENT TYPE-1 AND TYPE-2 FUZZY NEURAL NETWORKS IN REAL TIME SYSTEMS Delve into the type-2 fuzzy logic systems and become engrossed in the parameter update algorithms for type-1 and type-2 fuzzy neural networks and their stability analysis with this book! Not only does this book stand apart from others in its focus but also in its application-based presentation style. Prepared in a way that can be easily understood by those who are experienced and inexperienced in this field. Readers can benefit from the computer source codes for both identification and control purposes which are given at the end of the book. A clear and an in-depth examination has been made of all the necessary mathematical foundations, type-1 and type-2 fuzzy neural network structures and their learning algorithms as well as their stability analysis. You will find that each chapter is devoted to a different learning algorithm for the tuning of type-1 and type-2 fuzzy neural networks; some of which are: • Gradient descent • Levenberg-Marquardt • Extended Kalman filter In addition to the aforementioned conventional learning methods above, number of novel sliding mode control theory-based learning algorithms, which are simpler and have closed forms, and their stability analysis have been proposed. Furthermore, hybrid methods consisting of particle swarm optimization and sliding mode control theory-based algorithms have also been introduced. The potential readers of this book are expected to be the undergraduate and graduate students, engineers, mathematicians and computer scientists. Not only can this book be used as a reference source for a scientist who is interested in fuzzy neural networks and their real-time implementations but also as a course book of fuzzy neural networks or artificial intelligence in master or doctorate university studies. We hope that this book will serve its main purpose successfully. Parameter update algorithms for type-1 and type-2 fuzzy neural networks and their stability analysis Contains algorithms that are applicable to real time systems Introduces fast and simple adaptation rules for type-1 and type-2 fuzzy neural networks Number of case studies both in identification and control Provides MATLAB® codes for some algorithms in the book

Fuzzy Sliding Mode Control for Cart Inverted Pendulum System

Simulation and Experiment of Neural-network Fuzzy Sliding Mode Control for Leveling Control of Turbine Access System

The refereed proceedings of the 10th International Fuzzy Systems Association World Congress, IFSA 2003, held in June/July 2003 in Istanbul, Turkey. The 84 papers presented together with 5 invited papers were carefully reviewed and selected form 318 submissions. The papers address all current issues in the area and present the state of the art in fuzzy sets, fuzzy systems, and fuzzy logic and

their applications in a broad variety of fields. The papers are divided in four parts on mathematical issues, methodological issues, application areas, and cross-disciplinary issues.

An Introduction to Fuzzy Control

The aim of MSCE 2014 is to provide a platform for researchers, engineers, and academicians, as well as industrial professionals, to present their research results and development activities in mechanism science and control engineering. It provides opportunities for the delegates to exchange new ideas and application experiences, to establish business or research relations and to find global partners for future collaboration. MSCE2014 is conducted to all the researchers, engineers, industrial professionals and academicians, who are broadly welcomed to present their latest research results, academic developments or theory practice. Topics of interest include but are not limited to Mechanism theory and Application, Mechanical control and Automation Engineering, Mechanical Dynamics, Materials Processing and Control, Instruments and Vibration Control. It is of great pleasure to see the delegates exchanging ideas and establishing sound relationships on the conference.

Robot Manipulator Control

In this article, we focus on a suspension active magnetic bearing system that majorly experiences many disturbances. First, we construct a complete model of a suspension active magnetic bearing system composed of conventional proportional–integral–derivative controllers with two kinds of inputs and a robust control method, known as the sliding mode control method. On certain proportional–integral–derivative controllers, the sliding mode control method is used to control linear or nonlinear systems while a chattering phenomenon occurred in each time period. This chattering is due to the high-frequency characteristic of this control method, but it was represented a major disadvantage. Therefore, we propose these techniques for reducing much of this chattering, and then we also propose a fuzzy controller as the control model. In regard to the sliding mode, the fuzzy controller of input and output signals approximates the signals of the proportional–integral–derivative and sliding mode control controller outputs. We also replace the signum function from the saturation function and use the MATLAB Simulink programming environment in our design work. Finally, we compare the average and maximum tracking errors with those of a method proposed by Lin et al. and find that the results of our proposed control method tracks very well with the sinusoidal input signal and also much better than the other method.

Afro-European Conference for Industrial Advancement

Model Based Fuzzy Control uses a given conventional or fuzzy open loop model of the plant under control to derive the set of fuzzy rules for the fuzzy controller. Of central interest are the stability, performance, and robustness of the resulting closed loop system. The major objective of model based fuzzy control is to use the full range of linear and nonlinear design and analysis methods to design such fuzzy

controllers with better stability, performance, and robustness properties than non-fuzzy controllers designed using the same techniques. This objective has already been achieved for fuzzy sliding mode controllers and fuzzy gain schedulers - the main topics of this book. The primary aim of the book is to serve as a guide for the practitioner and to provide introductory material for courses in control theory.

Fuzzy Sets and Systems - IFSA 2003

This book includes the proceedings of the Intelligent and Fuzzy Techniques INFUS 2019 Conference, held in Istanbul, Turkey, on July 23–25, 2019. Big data analytics refers to the strategy of analyzing large volumes of data, or big data, gathered from a wide variety of sources, including social networks, videos, digital images, sensors, and sales transaction records. Big data analytics allows data scientists and various other users to evaluate large volumes of transaction data and other data sources that traditional business systems would be unable to tackle. Data-driven and knowledge-driven approaches and techniques have been widely used in intelligent decision-making, and they are increasingly attracting attention due to their importance and effectiveness in addressing uncertainty and incompleteness. INFUS 2019 focused on intelligent and fuzzy systems with applications in big data analytics and decision-making, providing an international forum that brought together those actively involved in areas of interest to data science and knowledge engineering. These proceeding feature about 150 peer-reviewed papers from countries such as China, Iran, Turkey, Malaysia, India, USA, Spain, France, Poland, Mexico, Bulgaria, Algeria, Pakistan, Australia, Lebanon, and Czech Republic.

Proportional–integral–derivative/fuzzy Sliding Mode Control for Suspension of Active Magnetic Bearing System

This book presents a detailed discussion of intelligent techniques to measure the displacement of buildings when they are subjected to vibration. It shows how these techniques are used to control active devices that can reduce vibration 60–80% more effectively than widely used passive anti-seismic systems. After introducing various structural control devices and building-modeling and active structural control methods, the authors propose offset cancellation and high-pass filtering techniques to solve some common problems of building-displacement measurement using accelerometers. The most popular control algorithms in industrial settings, PD/PID controllers, are then analyzed and then combined with fuzzy compensation. The stability of this combination is proven with standard weight-training algorithms. These conditions provide explicit methods for selecting PD/PID controllers. Finally, fuzzy-logic and sliding-mode control are applied to the control of wind-induced vibration. The methods described are supported by reports of experimental studies on a two-story building prototype. This book is a valuable resource for academic researchers interested in the effects of control and mechatronic devices within buildings, or those studying the principles of vibration reduction. Practicing engineers working on the design and construction of any sort of high-rise or vulnerable building and concerned with the effects of either wind or seismic disturbances benefit from the efficacy of the methods proposed.

Intelligent Control and Automation

This volume contains accepted papers presented at AECIA2014, the First International Afro-European Conference for Industrial Advancement. The aim of AECIA was to bring together the foremost experts as well as excellent young researchers from Africa, Europe, and the rest of the world to disseminate latest results from various fields of engineering, information, and communication technologies. The first edition of AECIA was organized jointly by Addis Ababa Institute of Technology, Addis Ababa University, and VSB - Technical University of Ostrava, Czech Republic and took place in Ethiopia's capital, Addis Ababa.

Advanced Sliding Mode Control for Mechanical Systems

Annotation Proceedings of the July 1997 symposium, Towards New Computational Principles for Robotics and Automation. Topics of the 63 papers and plenary talks include learning and control of motions; navigational map construction and localization; learning for sensor-based manipulation; biologically inspired robotics; exploration of environment with sonars; intelligent systems with Q-learning; fusion of human and machine intelligence for telerobotic systems; NN-based function approximation for arm control; sequential decision-making; sensor fusion; evolutionary computation; visual recognition of shapes and targets; robot skills; and vision-based tracking. No index. Annotation copyrighted by Book News, Inc., Portland, OR.

Design of H[infinity] ANFIS-Based Fuzzy Sliding Mode Controller

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

Applications of Sliding Mode Control

Written by two of Europe’s leading robotics experts, this book provides the tools for a unified approach to the modelling of robotic manipulators, whatever their mechanical structure. No other publication covers the three fundamental issues of

robotics: modelling, identification and control. It covers the development of various mathematical models required for the control and simulation of robots. · World class authority · Unique range of coverage not available in any other book · Provides a complete course on robotic control at an undergraduate and graduate level

Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems

Applications of Sliding Mode Control in Science and Engineering

The main purpose of control engineering is to steer the regulated plant in such a way that it operates in a required manner. The desirable performance of the plant should be obtained despite the unpredictable influence of the environment on the control system and no matter if the plant parameters are precisely known. Even though the parameters may change with time and load, still the system should preserve its nominal properties and ensure the required behavior of the plant. In other words, the principal objective of control engineering is to design systems that are robust with respect to external disturbances and modeling uncertainty. This objective may be very well achieved using the sliding mode technique, which is the subject of this book.

Sliding Mode Control Using MATLAB

Advances and Applications in Sliding Mode Control systems

We often come across computational optimization virtually in all branches of engineering and industry. Many engineering problems involve heuristic search and optimization, and, once discretized, may become combinatorial in nature, which gives rise to certain difficulties in terms of solution procedure. Some of these problems have enormous search spaces, are NP-hard and hence require heuristic solution techniques. Another difficulty is the lack of ability of classical solution techniques to determine appropriate optima of non-convex problems. Under these conditions, recent advances in computational optimization techniques have been shown to be advantageous and successful compared to classical approaches. This Volume presents some of the latest developments with a focus on the design of algorithms for computational optimization and their applications in practice. Through the chapters of this book, researchers and practitioners share their experience and newest methodologies with regard to intelligent optimization and provide various case studies of the application of intelligent optimization techniques in real-world applications.This book can serve as an excellent reference for researchers and graduate students in computer science, various engineering disciplines and the industry.

Automatic Control, Mechatronics and Industrial Engineering

This book focuses on safeguarding civil structures and residents from natural hazards such as earthquakes through the use of active control. It proposes novel proportional-derivative (PD) and proportional-integral-derivative (PID) controllers, as well as discrete-time sliding mode controllers (DSMCs) for the vibration control of structures involving nonlinearities. Fuzzy logic techniques are used to compensate for nonlinearities. The first part of the book addresses modelling and feedback control in inelastic structures and presents a design for PD/PID controllers. In the second part, classical PD/PID and type-2 fuzzy control techniques are combined to compensate for uncertainties in the structures of buildings. The methodology for tuning the gains of PD/PID is obtained using Lyapunov stability theory, and the system's stability is verified. Lastly, the book puts forward a DSMC design that does not require system parameters, allowing it to be more flexibly applied. All program codes used in the paper are presented in a MATLAB®/Simulink® environment. Given its scope, the book will be of interest to mechanical and civil engineers, and to advanced undergraduate and graduate engineering students in the areas of structural engineering, structural vibration, and advanced control.

Model Based Fuzzy Control

Results of the International Conference on Intelligent Computing, ICIC 2006: Lecture Notes in Computer Science (LNCS), Lecture Notes in Artificial Intelligence (LNAI), Lecture Notes in Bioinformatics (LNBI), Lecture Notes in Control and Information Sciences (LNCIS). 142 revised full papers are organized in topical sections: Blind Source Separation; Intelligent Sensor Networks; Intelligent Control and Automation; and Data Fusion, Knowledge Discovery, and Data Mining. Includes a Special Session on Smart and Intelligent Home Technology.

Fuzzy Sliding Mode Control Algorithm for Four Wheel Skid Steer Vehicle

This book presents essential studies and applications in the context of sliding mode control, highlighting the latest findings from interdisciplinary theoretical studies, ranging from computational algorithm development to representative applications. Readers will learn how to easily tailor the techniques to accommodate their ad hoc applications. To make the content as accessible as possible, the book employs a clear route in each paper, moving from background to motivation, to quantitative development (equations), and lastly to case studies/illustrations/tutorials (simulations, experiences, curves, tables, etc.). Though primarily intended for graduate students, professors and researchers from related fields, the book will also benefit engineers and scientists from industry.

International Conference on Mechanism Science and Control Engineering (MSCE 2014)

This volume gathers the latest advances, innovations, and applications in the field of geographic information systems and unmanned aerial vehicle (UAV) technologies, as presented by leading researchers and engineers at the 1st International Conference on Unmanned Aerial System in Geomatics (UASG), held in

Roorkee, India on April 6-7, 2019. It covers highly diverse topics, including photogrammetry and remote sensing, surveying, UAV manufacturing, geospatial data sensing, UAV processing, visualization, and management, UAV applications and regulations, geo-informatics and geomatics. The contributions, which were selected by means of a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaboration among different specialists.

2018 IEEE XXV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)

We invite contributions on latest development of the applications of electronics, electrical and computing technology

Recent Advances in Sliding Modes: From Control to Intelligent Mechatronics

The ICMEA2014 will provide an excellent international academic forum for sharing knowledge and results in theory, methodology and applications of Mechanical Engineering and Automation. The ICMEA2014 is organized by Advanced Information Science Research Center (AISRC) and is co-sponsored by Chongqing University, Changsha University of Science & Technology, Huazong University of Science and Technology and China Three Gorges University. This ICMEA2014 proceedings tends to collect the up-to-date, comprehensive and worldwide state-of-art knowledge on mechanical engineering and automation, including control theory and application, mechanic manufacturing system and automation, and Computer Science and applications. All of accepted papers were subjected to strict peer-reviewing by 2-4 expert referees. The papers have been selected for this volume because of quality and the relevance to the conference. We hope this book will not only provide the readers a broad overview of the latest research results, but also provide the readers a valuable summary and reference in these fields. ICMEA2014 organizing committee would like to express our sincere appreciations to all authors for their contributions to this book. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard working.

Intelligent Computational Optimization in Engineering

Sliding Mode Control of Switching Power Converters: Techniques and Implementation is perhaps the first in-depth account of how sliding mode controllers can be practically engineered to optimize control of power converters. A complete understanding of this process is timely and necessary, as the electronics industry moves toward the use of renewable energy sources and widely varying loads that can be adequately supported only by power converters using nonlinear controllers. Of the various advanced control methods used to handle the complex requirements of power conversion systems, sliding mode control (SMC) has been most widely investigated and proved to be a more feasible alternative than fuzzy and adaptive control for existing and future power converters. Bridging the gap between power electronics and control theory, this book employs a top-down

instructional approach to discuss traditional and modern SMC techniques. Covering everything from equations to analog implantation, it: Provides a comprehensive general overview of SMC principles and methods Offers advanced readers a systematic exposition of the mathematical machineries and design principles relevant to construction of SMC, then introduces newer approaches Demonstrates the practical implementation and supporting design rules of SMC, based on analog circuits Promotes an appreciation of general nonlinear control by presenting it from a practical perspective and using familiar engineering terminology With specialized coverage of modeling and implementation that is useful to students and professionals in electrical and electronic engineering, this book clarifies SMC principles and their application to power converters. Making the material equally accessible to all readers, whether their background is in analog circuit design, power electronics, or control engineering, the authors—experienced researchers in their own right—elegantly and practically relate theory, application, and mathematical concepts and models to corresponding industrial targets.

2014 International Conference on Mechanical Engineering and Automation (ICMEA2014)

This volume is dedicated to Professor Okyay Kaynak to commemorate his life time impactful research and scholarly achievements and outstanding services to profession. The 21 invited chapters have been written by leading researchers who, in the past, have had association with Professor Kaynak as either his students and associates or colleagues and collaborators. The focal theme of the volume is the Sliding Modes covering a broad scope of topics from theoretical investigations to their significant applications from Control to Intelligent Mechatronics.

Active Control of Bidirectional Structural Vibration

In the skid steer vehicle the velocity constraints are quite different from other vehicle in terms of its wheels having to skid laterally to follow the curved path. The wheels of the skid steer vehicle are non-steerable; the vehicle is turned as the differential torque is applied to the wheels on the opposite sides. Motion control for skid steer vehicle is particularly challenging due to the non-linearities that arise from tire slip and braking. Moreover the instantaneous center of rotation may move out of the skid steer vehicle base causing loss of motion stability. Therefore it is difficult to model the accurate path following of skid steer vehicle. This implies that the control at the kinematic level is not sufficient enough and in general demands to use the dynamic model. In this research the mathematical model of four wheel skid steer vehicle is built with parameters of P-3AT skid steer mobile robot. This model is hybrid of vehicle dynamics and the semi-empirical tire model (TM-easy tire model). The model is used to synthesize and design of the sliding mode control law with fuzzy switching regulator.

Active Structural Control with Stable Fuzzy PID Techniques

"Advanced Sliding Mode Control for Mechanical Systems: Design, Analysis and MATLAB Simulation" takes readers through the basic concepts, covering the most recent research in sliding mode control. The book is written from the perspective of

practical engineering and examines numerous classical sliding mode controllers, including continuous time sliding mode control, discrete time sliding mode control, fuzzy sliding mode control, neural sliding mode control, backstepping sliding mode control, dynamic sliding mode control, sliding mode control based on observer, terminal sliding mode control, sliding mode control for robot manipulators, and sliding mode control for aircraft. This book is intended for engineers and researchers working in the field of control. Dr. Jinkun Liu works at Beijing University of Aeronautics and Astronautics and Dr. Xinhua Wang works at the National University of Singapore.

Fuzzy Neural Networks for Real Time Control Applications

Sliding Mode Control Using MATLAB provides many sliding mode controller design examples, along with simulation examples and MATLAB® programs. Following the review of sliding mode control, the book includes sliding mode control for continuous systems, robust adaptive sliding mode control, sliding mode control for underactuated systems, backstepping, and dynamic surface sliding mode control, sliding mode control based on filter and observer, sliding mode control for discrete systems, fuzzy sliding mode control, neural network sliding mode control, and sliding mode control for robot manipulators. The contents of each chapter are independent, providing readers with information they can use for their own needs. It is suitable for the readers who work on mechanical and electronic engineering, electrical automation engineering, etc., and can also be used as a teaching reference for universities. Provides many sliding mode controller design examples to help readers solve their research and design problems Includes various, implementable, robust sliding mode control design solutions from engineering applications Provides the simulation examples and MATLAB programs for each sliding mode control algorithm

Fuzzy Logic for the Applications to Complex Systems

Engineering technology development and implementation play an important role in making the industry more sustainable in an increasingly competitive world. This book covers significant recent developments in both fundamental and applied research in the engineering field. Domains of application include, but are not limited to, Intelligent Control Systems and Optimization, Signal Processing, Sensors, Systems Modeling and Control, Robotics and Automation, Industrial and Electric Engineering, Production and Management. This book is an excellent reference work to get up to date with the latest research and developments in the fields of Automation, Mechatronics and Industrial Engineering. It aims to provide a platform for researchers and professionals in all relevant fields to gain new ideas and establish great achievements in scientific development.

Recent Developments in Sliding Mode Control

In this paper, the robust vibration control of a rotating carbon nanotube reinforced composite beam subjected to a temperature rise is studied. The governing mathematical partial differential equations are derived by Hamilton’s principle based on Euler–Bernoulli beam theory. The Galerkin method is then used to obtain

the temporal ordinary differential equations and therefore to perform vibration analysis. For the purpose of vibration control, piezoelectric patches are used as sensors to measure the displacement of the beam and as actuators to implement control forces. A model-free adaptive fuzzy sliding mode controller is utilized to suppress the vibration of the rotating carbon nanotube reinforced composite beam. Since the plant's state vector cannot be measured for control purposes and only the piezoelectric sensor's output is available, a model-free adaptive fuzzy sliding mode observer is proposed here. Simulation studies demonstrate the effectiveness of the proposed method.

1997 IEEE International Symposium on Computational Intelligence in Robotics and Automation

This volume presents an interesting mix of topics on complex systems such as information systems, engineering systems, fuzzy neural systems, image processing, robotics, fuzzy control, genetic algorithms, and fuzzy decision making. The contributions come from 12 countries, and provide a clear picture of fuzzy logic applications worldwide. Contents:LIFE Project in Japan (T Terano & K Nakamura)Fuzzy Models and Explicit Functions (L T Koczy & P Varlaki)A Precedent-Based Legal Judgement System Using Fuzzy Relationship Database (K Hirota et al.)The Design of an Adaptive Multiple Agent Constraint-Based Controller for a Complex Hydraulic System (P P Wang et al.)Automatic Labeling of Human Brain Structures in 3D MRI Using Fuzzy Logic (J Yen et al.)Auto-Generation of Fuzzy Production Rules Using Hyper-Cone Membership Function by Genetic Algorithm (H Inoue et al.)Weighted Fuzzy Expected Values and Their Applications (A Kandel & M Friedman)Combining Fuzzy Quantifiers (A L Ralescu et al.)Combining Fuzzy Quantifiers (A L Ralescu et al.)Principal Components, B-Splines, and Fuzzy System Reduction (J Yen et al.)Conditioning in Possibility Theory (A Ramer)User Equilibrium in Traffic Assignment — An Application of Variational Inequality with Fuzzy Functions (H-F Wang & H-S Liao)Applicable Conditions on the Linear Interpolative Reasoning Method in Sparse Fuzzy Rule Bases (M Mizumoto & Y Shi)and other papers Readership: Computer scientists and control engineers. keywords:

Modeling, Identification and Control of Robots

Robot Manipulator Control offers a complete survey of control systems for serial-link robot arms and acknowledges how robotic device performance hinges upon a well-developed control system. Containing over 750 essential equations, this thoroughly up-to-date Second Edition, the book explicates theoretical and mathematical requisites for controls design and summarizes current techniques in computer simulation and implementation of controllers. It also addresses procedures and issues in computed-torque, robust, adaptive, neural network, and force control. New chapters relay practical information on commercial robot manipulators and devices and cutting-edge methods in neural network control.