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KEY=PENDULUM - ALESSANDRA HOWELL

SLIDING MODE CONTROL AND OBSERVATION

Springer Science & Business Media *The sliding mode control methodology has proven effective in dealing with complex dynamical systems affected by disturbances, uncertainties and unmodeled dynamics. Robust control technology based on this methodology has been applied to many real-world problems, especially in the areas of aerospace control, electric power systems, electromechanical systems, and robotics. Sliding Mode Control and Observation represents the first textbook that starts with classical sliding mode control techniques and progresses toward newly developed higher-order sliding mode control and observation algorithms and their applications. The present volume addresses a range of sliding mode control issues, including: *Conventional sliding mode controller and observer design *Second-order sliding mode controllers and differentiators *Frequency domain analysis of conventional and second-order sliding mode controllers *Higher-order sliding mode controllers and differentiators *Higher-order sliding mode observers *Sliding mode disturbance observer based control *Numerous applications, including reusable launch vehicle and satellite formation control, blood glucose regulation, and car steering control are used as case studies Sliding Mode Control and Observation is aimed at graduate students with a basic knowledge of classical control theory and some knowledge of state-space methods and nonlinear systems, while being of interest to a wider audience of graduate students in electrical/mechanical/aerospace engineering and applied mathematics, as well as researchers in electrical, computer, chemical, civil, mechanical, aeronautical, and industrial engineering, applied mathematicians, control engineers, and physicists. Sliding Mode Control and Observation provides the necessary tools for graduate students, researchers and engineers to robustly control complex and uncertain nonlinear dynamical systems. Exercises provided at the end of each chapter make this an ideal text for an advanced course taught in control theory.*

SLIDING MODES IN CONTROL AND OPTIMIZATION

Springer Science & Business Media *The book is devoted to systems with discontinuous control. The study of discontinuous dynamic systems is a multifacet problem which embraces mathematical, control theoretic and application aspects. Times and again, this problem has been approached by mathematicians, physicists and engineers, each profession treating it from its own positions. Interestingly, the results obtained by specialists in different disciplines have almost always had a significant effect upon the development of the control theory. It suffices to mention works on the theory of oscillations of discontinuous nonlinear systems, mathematical studies in ordinary differential equations with discontinuous righthand parts or variational problems in nonclassic statements. The unremitting interest to discontinuous control systems enhanced by their effective application to solution of problems most diverse in their physical nature and functional purpose is, in the author's opinion, a cogent argument in favour of the importance of this area of studies. It seems a useful effort to consider, from a control theoretic viewpoint, the mathematical and application aspects of the theory of discontinuous dynamic systems and determine their place within the scope of the present-day control theory. The first attempt was made by the author in 1975-1976 in his course on "The Theory of Discontinuous Dynamic Systems" and "The Theory of Variable Structure Systems" read to post-graduates at the University of Illinois, USA, and then presented in 1978-1979 at the seminars held in the Laboratory of Systems with Discontinous Control at the Institute of Control Sciences in Moscow.*

DISCRETE-TIME SLIDING MODE CONTROL

A MULTIRATE OUTPUT FEEDBACK APPROACH

Springer Science & Business Media *Sliding mode control is a simple and yet robust control technique, where the system states are made to confine to a selected subset. With the increasing use of computers and discrete-time samplers in controller implementation in the recent past, discrete-time systems and computer based control have become important topics. This monograph presents an output feedback sliding mode control philosophy which can be applied to almost all controllable and observable systems, while at the same time being simple enough as not to tax the computer too much. It is shown that the solution can be found in the synergy of the multirate output sampling concept and the concept of discrete-time sliding mode control.*

FUZZY CONTROL

Prentice Hall *Introduction; Fuzzy control: the basics; Case studies in design and implementation; nonlinear analysis; Fuzzy identification and estimation; Adaptive fuzzy control; Fuzzy supervisory control; Perspectives on fuzzy control.*

DISSIPATIVE SYSTEMS ANALYSIS AND CONTROL

THEORY AND APPLICATIONS

Springer Science & Business Media *This second edition of Dissipative Systems Analysis and Control has been substantially reorganized to accommodate new material and enhance its pedagogical features. It examines linear and nonlinear systems with examples of both in each chapter. Also included are some infinite-dimensional and nonsmooth examples. Throughout, emphasis is placed on the use of the dissipative properties of a system for the design of stable feedback control laws.*

THE REACTION WHEEL PENDULUM

Morgan & Claypool Publishers *This monograph is concerned with modeling and control of a novel inverted pendulum device known as the Reaction Wheel Pendulum. The Reaction Wheel Pendulum is perhaps the simplest of the various pendulum systems in terms of its dynamic properties. At the same time, the Reaction Wheel Pendulum exhibits several properties, such as underactuation and nonlinearity that make it an attractive and useful system for research and advanced education. As such, the Reaction Wheel Pendulum is ideally suited for educating engineering students at virtually every level, from freshman to advanced graduate students.*

APPLICATIONS OF SLIDING MODE CONTROL

Springer *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.*

INTELLIGENT CONTROL SYSTEMS AND SIGNAL PROCESSING 2003

(ICONS 2003) ; A PROCEEDINGS VOLUME FROM THE IFAC INTERNATIONAL CONFERENCE, FARO, ALGARVE, PORTUGAL, 8-11 APRIL 2003

Pergamon Press *KEY FEATURES: The first IFAC conference and thus proceedings to be specifically devoted to this field Presents the findings of experts and practitioners from the major soft- computing themes Provides an overview of the theory and applications of intelligent control systems and signal*

processing Intelligent control systems and signal processing 2003 contains the selection of papers presented at the IFAC International Conference on Intelligent Control systems and Signal Processing (ICONS) 2003. The conference was sponsored by the most important organizations in the field, among them were the Institue of Electrical and Electronic Engineers (IEEE), and the Control Systems Society (CSS) This proceedings volume contains 98 papers, with three separate reviewers having reviewed all papers, Including six plenary lectures given by leading experts in the field.

EMERGING TRENDS IN COMPUTING AND EXPERT TECHNOLOGY

Springer Nature This book presents high-quality research papers that demonstrate how emerging technologies in the field of intelligent systems can be used to effectively meet global needs. The respective papers highlight a wealth of innovations and experimental results, while also addressing proven IT governance, standards and practices, and new designs and tools that facilitate rapid information flows to the user. The book is divided into five major sections, namely: "Advances in High Performance Computing", "Advances in Machine and Deep Learning", "Advances in Networking and Communication", "Advances in Circuits and Systems in Computing" and "Advances in Control and Soft Computing".

INTRODUCTION TO FUZZY SETS, FUZZY LOGIC, AND FUZZY CONTROL SYSTEMS

CRC Press In the early 1970s, fuzzy systems and fuzzy control theories added a new dimension to control systems engineering. From its beginnings as mostly heuristic and somewhat ad hoc, more recent and rigorous approaches to fuzzy control theory have helped make it an integral part of modern control theory and produced many exciting results. Yesterday's "art

INDEX TO IEEE PUBLICATIONS

Issues for 1973- cover the entire IEEE technical literature.

ADVANCED CONTROL ENGINEERING

Butterworth-Heinemann Advanced Control Engineering provides a complete course in control engineering for undergraduates of all technical disciplines. Included are real-life case studies, numerous problems, and accompanying MatLab programs.

THE PENDULUM

A CASE STUDY IN PHYSICS

OUP Oxford The pendulum: a case study in physics is a unique book in several ways. Firstly, it is a comprehensive quantitative study of one physical system, the pendulum, from the viewpoint of elementary and more advanced classical physics, modern chaotic dynamics, and quantum mechanics. In addition, coupled pendulums and pendulum analogs of superconducting devices are also discussed. Secondly, this book treats the physics of the pendulum within a historical and cultural context, showing, for example, that the pendulum has been intimately connected with studies of the earth's density, the earth's motion, and timekeeping. While primarily a physics book, the work provides significant added interest through the use of relevant cultural and historical vignettes. This approach offers an alternative to the usual modern physics courses. The text is amply illustrated and augmented by exercises at the end of each chapter.

ADVANCES IN COMMUNICATION, DEVICES AND NETWORKING

PROCEEDINGS OF ICCDN 2017

Springer The book provides insights of International Conference in Communication, Devices and Networking (ICCDN 2017) organized by the Department of Electronics and Communication Engineering, Sikkim Manipal Institute of Technology, Sikkim, India during 3 – 4 June, 2017. The book discusses latest research papers presented by researchers, engineers, academicians and industry professionals. It also assists both novice and experienced scientists and developers, to explore newer scopes, collect new ideas and establish new cooperation between research groups and exchange ideas, information, techniques and applications in the field of electronics, communication, devices and networking.

FRACTIONAL ORDER CONTROL AND SYNCHRONIZATION OF CHAOTIC SYSTEMS

Springer The book reports on the latest advances in and applications of fractional order control and synchronization of chaotic systems, explaining the concepts involved in a clear, matter-of-fact style. It consists of 30 original contributions written by eminent scientists and active researchers in the field that address theories, methods and applications in a number of research areas related to fractional order control and synchronization of chaotic systems, such as: fractional chaotic systems, hyperchaotic systems, complex systems, fractional order discrete chaotic systems, chaos control, chaos synchronization, jerk circuits, fractional chaotic systems with hidden attractors, neural network, fuzzy logic controllers, behavioral modeling, robust and adaptive control, sliding mode control, different types of synchronization, circuit realization of chaotic systems, etc. In addition to providing readers extensive information on chaos fundamentals, fractional calculus, fractional differential equations, fractional control and stability, the book also discusses key applications of fractional order chaotic systems, as well as multidisciplinary solutions developed via control modeling. As such, it offers the perfect reference guide for graduate students, researchers and practitioners in the areas of fractional order control systems and fractional order chaotic systems.

PROCEEDINGS OF THE IECON '93: POWER ELECTRONICS

ARTIFICIAL INTELLIGENCE RESOURCES IN CONTROL AND AUTOMATION ENGINEERING

Bentham Science Publishers "This e-book focuses on the application of artificial intelligence resources in fields related to Control and Automation Engineering. Techniques such as neural networks, fuzzy logic and expert systems are a key tool for researchers and engineers requiring "

SLIDING MODE CONTROL

THEORY AND APPLICATIONS

CRC Press In the formation of any control problem there will be discrepancies between the actual plant and the mathematical model for controller design. Sliding mode control theory seeks to produce controllers to over some such mismatches. This text provides the reader with a grounding in sliding mode control and is appropriate for the graduate with a basic knowledge of classical control theory and some knowledge of state-space methods. From this basis, more advanced theoretical results are developed. Two industrial case studies, which present the results of sliding mode controller implementations, are used to illustrate the successful practical application theory.

FUZZY CONTROL AND IDENTIFICATION

John Wiley & Sons This book gives an introduction to basic fuzzy logic and Mamdaniand Takagi-Sugeno fuzzy systems. The text shows howthese can be used to control complex nonlinear engineering systems,while also also suggesting several approaches to modelingof complex engineering systems with unknown models. Finally, fuzzy modeling and control methods are combined in thebook, to create adaptive fuzzy controllers, ending withan example of an obstacle-avoidance controller for an autonomousvehicle using modus ponendo tollens logic.

SLIDING MODE CONTROL IN ELECTRO-MECHANICAL SYSTEMS

CRC Press *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.*

NEURAL NETWORK CONTROL OF ROBOT MANIPULATORS AND NON-LINEAR SYSTEMS

CRC Press *There has been great interest in "universal controllers" that mimic the functions of human processes to learn about the systems they are controlling on-line so that performance improves automatically. Neural network controllers are derived for robot manipulators in a variety of applications including position control, force control, link flexibility stabilization and the management of high-frequency joint and motor dynamics. The first chapter provides a background on neural networks and the second on dynamical systems and control. Chapter three introduces the robot control problem and standard techniques such as torque, adaptive and robust control. Subsequent chapters give design techniques and Stability Proofs For NN Controllers For Robot Arms, Practical Robotic systems with high frequency vibratory modes, force control and a general class of non-linear systems. The last chapters are devoted to discrete- time NN controllers. Throughout the text, worked examples are provided.*

THEINVERTED PENDULUM IN CONTROL THEORY AND ROBOTICS

FROM THEORY TO NEW INNOVATIONS

IET *This book provides an overall picture of historical and current trends and developments in nonlinear control theory, based on the simple structure and rich nonlinear model of the inverted pendulum.*

ROBUST CONTROL DESIGN WITH MATLAB®

Springer Science & Business Media *Shows readers how to exploit the capabilities of the MATLAB® Robust Control and Control Systems Toolboxes to the fullest using practical robust control examples.*

CONTROL OF MACHINES WITH FRICTION

Springer Science & Business Media *It is my ambition in writing this book to bring tribology to the study of control of machines with friction. Tribology, from the greek for study of rubbing, is the discipline that concerns itself with friction, wear and lubrication. Tribology spans a great range of disciplines, from surface physics to lubrication chemistry and engineering, and comprises investigators in diverse specialities. The English language tribology literature now grows at a rate of some 700 articles per year. But for all of this activity, in the three years that I have been concerned with the control of machines with friction, I have but once met a fellow controls engineer who was aware that the field existed, this including many who were concerned with friction. In this vein I must confess that, before undertaking these investigations, I too was unaware that an active discipline of friction existed. The experience stands out as a mark of the specialization of our time. Within tribology, experimental and theoretical understanding of friction in lubricated machines is well developed. The controls engineer's interest is in dynamics, which is not the central interest of the tribologist. The tribologist is more often concerned with wear, with respect to which there has been enormous progress - witness the many mechanisms which we buy today that are lubricated once only, and that at the factory. Though a secondary interest, frictional dynamics are note forgotten by tribology.*

TYPE-2 FUZZY LOGIC: THEORY AND APPLICATIONS

Springer Science & Business Media *This book describes new methods for building intelligent systems using type-2 fuzzy logic and soft computing (SC) techniques. The authors extend the use of fuzzy logic to a higher order, which is called type-2 fuzzy logic. Combining type-2 fuzzy logic with traditional SC techniques, we can build powerful hybrid intelligent systems that can use the advantages that each technique offers. This book is intended to be a major reference tool and can be used as a textbook.*

RECENT ADVANCES IN SLIDING MODES: FROM CONTROL TO INTELLIGENT MECHATRONICS

Springer *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.*

SLIDING MODE CONTROL USING NOVEL SLIDING SURFACES

Springer *AftersurveypaperbyUtkininthelate1970s,slidingmodecontrolmeth- ologies emerged as an e?ective tool to tackle uncertainty and disturbances which are inevitable in most of the practical systems. Sliding mode control is a particular class of variable structure control which was introduced by Emel'yanov and his colleagues. The design paradigms of sliding mode c- trol has now become a mature design technique for the design of robust c- troller of uncertain system. In sliding mode technique, the state trajectory of the system is constrained on a chosen manifold (or within some neighb- hood thereof) by an appropriatecontrolaction. This manifold is also called a switching surface or a sliding surface. During sliding mode, system dynamics is governed by the chosen manifold which results in a well celebrated inva- ance property towards certain classes of disturbance and model mismatches. The purpose of this monograph is to give a di?erent dimension to sl- ing surface design to achieve high performance of the system. Design of the switching surface is vital because the closed loop dynamics is governed by the parameters of the sliding surface. Therefore sliding surface should be - signed to meet the closed loop speci?cations. Many systems demand high performance with robustness. To address this issue of achieving high perf- mance with robustness, we propose nonlinear surfaces for di?erent classes of systems. The nonlinear surface is designed such that it changes the system's closed-loop damping ratio from its initial low value to a ?nal high value.*

TRENDS IN ADVANCED INTELLIGENT CONTROL, OPTIMIZATION AND AUTOMATION

PROCEEDINGS OF KKA 2017—THE 19TH POLISH CONTROL CONFERENCE, KRAKÓW, POLAND, JUNE 18-21, 2017

Springer *This volume contains the proceedings of the KKA 2017 – the 19th Polish Control Conference, organized by the Department of Automatics and Biomedical Engineering, AGH University of Science and Technology in Kraków, Poland on June 18–21, 2017, under the auspices of The Committee on Automatic Control and Robotics of the Polish Academy of Sciences, and the Commission for Engineering Sciences of the Polish Academy of Arts and Sciences. Part 1 deals with general issues of modeling and control, notably flow modeling and control, sliding mode, predictive, dual, etc. control. In turn, Part 2 focuses on optimization, estimation and prediction for control. Part 3 is concerned with autonomous vehicles, while Part 4 addresses applications. Part 5 discusses computer methods in control, and Part 6 examines fractional order calculus in the modeling and control of dynamic systems. Part 7 focuses on modern robotics. Part 8 deals with modeling and identification, while Part 9 deals with problems related to security, fault detection and diagnostics. Part 10 explores intelligent systems in automatic control, and Part 11 discusses the use of control tools and techniques in biomedical engineering. Lastly, Part 12 considers engineering education and teaching with regard to automatic control and robotics.*

MOTION CONTROL SYSTEMS

John Wiley & Sons *Motion Control Systems is concerned with design methods that support the never-ending requirements for faster and more accurate control of mechanical motion. The book presents material that is fundamental, yet at the same time discusses the solution of complex problems in motion control systems. Methods presented in the book are based on the authors' original research results. Mathematical complexities are kept to a required minimum so that practicing engineers as well as students with a limited background in control may use the book. It is unique in presenting know-how accumulated through work on very diverse problems into a comprehensive unified approach suitable for application in high demanding, high-tech products. Major issues covered include motion control ranging from simple trajectory tracking and force control, to topics related to haptics, bilateral control with and without delay in measurement and control channels, as well as control of nonredundant and redundant multibody systems. Provides a consistent unified theoretical framework for motion control design Offers graduated increase in complexity and reinforcement throughout the book Gives detailed explanation of underlying similarities and specifics in motion control Unified treatment of single degree-of-freedom and multibody systems Explains the fundamentals through implementation examples Based on classroom-tested materials and the authors' original research work Written by the leading researchers in sliding mode control (SMC) and disturbance observer (DOB) Accompanying lecture notes for instructors Simulink and MATLAB® codes available for readers to download Motion Control Systemsis an ideal textbook for a course on motion control or as a reference for post-graduates and researchers in robotics and mechatronics. Researchers and practicing engineers will also find the techniques helpful in designing mechanical motion systems.*

INTRODUCTION TO CONTROL ENGINEERING

MODELING, ANALYSIS AND DESIGN

New Age International *The Text Is Written From The Engineer'S Point Of View To Explain The Basic Oncepts Involved In Feedback Control Theory. The Material In The Text Has Been Organized For Gradual And Sequential Development Of Control Theory Starting With A Statement Of The Task Of A Control Engineer At The Very Outset. The Book Is Tended For An Introductory Undergraduate Course In Control Systems For Engineering Students.This Text Presents A Comprehensive Analysis And Design Of Continuous-Time Control Systems And Includes More Than Introductory Material For Discrete Systems With Adequate Guidelines To Extend The Results Derived In Connection Continuous-Time Systems. The Prerequisite For The Reader Is Some Elementary Owledge Of Differential Equations, Vector-Matrix Analysis And Mechanics. Transfer Function And State Variable Models Of Typical Components And Subsystems Have Been Derived In The Appendix At The End Of The Book.Most Of The Materials Including Solved And Unsolved Problems Presented In The Book Have Been Class-Tested In Senior Undergraduates And First Year Graduate El Courses In The Field Of Control Systems At The Electronics And Telecommunication Engineering Department, Jadavpur University. Matlab Is The Most Widely Used Cad Software Package In Universities Throughout The World. Some Representative Matlab Scripts Used For Solving Problems Are Cluded At The End Of Each Chapter. The Detailed Design Steps Of Fuzzy Logic Based Controller Using Simulink And Matlab Has Been Provided In The Book To Give The Student A Head Start In This Emerging Discipline.A Chapter Has Been Included To Deal With Nonlinear Components And Their Analysis G Matlab And Simulink Through User Defined S-Functions. Finally, A Chapter Has Been Included To Deal With The Implementation Of Digital Controllers On Finite Bit Computer, To Bring Out The Problems Associated With Digital Trollers. In View Of Extensive Use Of Matlab For Rapid Verification Of Controller Designs, Some Notes For Using Matlab Script M-Files And Function M-Files Are Included At The End Of The Book.*

VARIABLE STRUCTURE SYSTEMS

FROM PRINCIPLES TO IMPLEMENTATION

IET *This unique book fulfils the definite need for an accessible book on variable structure systems and also provides the very latest results in research on this topic. Divided into three parts - basics of sliding mode control, new trends in sliding mode control, and applications of sliding mode control - the book contains many numerical design examples, so that readers can quickly understand the design methodologies and their applications to practical problems. Primarily aimed at students and researchers in the field, the book will also be useful for practising control engineers.*

FUZZY REASONING IN INFORMATION, DECISION AND CONTROL SYSTEMS

Springer Science & Business Media *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.*

SLIDING MODE CONTROL IN ENGINEERING

CRC Press *Provides comprehensive coverage of the most recent developments in the theory of non-Archimedean pseudo-differential equations and its application to stochastics and mathematical physics--offering current methods of construction for stochastic processes in the field of p-adic numbers and related structures. Develops a new theory for parabolic equat*

A COURSE IN FUZZY SYSTEMS AND CONTROL

Prentice Hall *Provides a comprehensive, self-tutorial course in fuzzy logic and its increasing role in control theory. It summarizes the important results of the field in a well-structured framework.*

MAGNETIC BEARINGS

THEORY, DESIGN, AND APPLICATION TO ROTATING MACHINERY

Springer Science & Business Media *Compiling the expertise of nine pioneers of the field, Magnetic Bearings - Theory, Design, and Application to Rotating Machinery offers an encyclopedic study of this rapidly emerging field with a balanced blend of commercial and academic perspectives. Every element of the technology is examined in detail, beginning at the component level and proceeding through a thorough exposition of the design and performance of these systems. The book is organized in a logical fashion, starting with an overview of the technology and a survey of the range of applications. A background chapter then explains the central concepts of active magnetic bearings while avoiding a morass of technical details. From here, the reader continues to a meticulous, state-of-the-art exposition of the component technologies and the manner in which they are assembled to form the AMB/rotor system. These system models and performance objectives are then tied together through extensive discussions of control methods for both rigid and flexible rotors, including consideration of the problem of system dynamics identification. Supporting this, the issues of system reliability and fault management are discussed from several useful and complementary perspectives. At the end of the book, numerous special concepts and systems, including micro-scale bearings, self-bearing motors, and self-sensing bearings, are put forth as promising directions for new research and development. Newcomers to the field will find the material highly accessible while veteran practitioners will be impressed by the level of technical detail that emerges from a combination of sophisticated analysis and insights gleaned from many collective years of practical experience. An exhaustive, self-contained text on active magnetic bearing technology, this book should be a core reference for anyone seeking to understand or develop systems using magnetic bearings.*

REINFORCEMENT LEARNING, SECOND EDITION

AN INTRODUCTION

MIT Press *The significantly expanded and updated new edition of a widely used text on reinforcement learning, one of the most active research areas in artificial intelligence. Reinforcement learning, one of the most active research areas in artificial intelligence, is a computational approach to learning whereby an agent tries to maximize the total amount of reward it receives while interacting with a complex, uncertain environment. In Reinforcement Learning, Richard Sutton and Andrew Barto provide a clear and simple account of the field's key ideas and algorithms. This second edition has been significantly expanded and updated, presenting new topics and updating coverage of other topics. Like the first edition, this second edition focuses on core online learning algorithms, with the more mathematical material set off in shaded boxes. Part I covers as much of reinforcement learning as*

possible without going beyond the tabular case for which exact solutions can be found. Many algorithms presented in this part are new to the second edition, including UCB, Expected Sarsa, and Double Learning. Part II extends these ideas to function approximation, with new sections on such topics as artificial neural networks and the Fourier basis, and offers expanded treatment of off-policy learning and policy-gradient methods. Part III has new chapters on reinforcement learning's relationships to psychology and neuroscience, as well as an updated case-studies chapter including AlphaGo and AlphaGo Zero, Atari game playing, and IBM Watson's wagering strategy. The final chapter discusses the future societal impacts of reinforcement learning.

ROBOTICS AND WELL-BEING

Springer *This book highlights some of the most pressing safety, ethical, legal and societal issues related to the diverse contexts in which robotic technologies apply. Focusing on the essential concept of well-being, it addresses topics that are fundamental not only for research, but also for industry and end-users, discussing the challenges in a wide variety of applications, including domestic robots, autonomous manufacturing, personal care robots and drones.*

THE FRACTIONAL CALCULUS THEORY AND APPLICATIONS OF DIFFERENTIATION AND INTEGRATION TO ARBITRARY ORDER

Elsevier *In this book, we study theoretical and practical aspects of computing methods for mathematical modelling of nonlinear systems. A number of computing techniques are considered, such as methods of operator approximation with any given accuracy; operator interpolation techniques including a non-Lagrange interpolation; methods of system representation subject to constraints associated with concepts of causality, memory and stationarity; methods of system representation with an accuracy that is the best within a given class of models; methods of covariance matrix estimation; methods for low-rank matrix approximations; hybrid methods based on a combination of iterative procedures and best operator approximation; and methods for information compression and filtering under condition that a filter model should satisfy restrictions associated with causality and different types of memory. As a result, the book represents a blend of new methods in general computational analysis, and specific, but also generic, techniques for study of systems theory ant its particular branches, such as optimal filtering and information compression. - Best operator approximation, - Non-Lagrange interpolation, - Generic Karhunen-Loeve transform - Generalised low-rank matrix approximation - Optimal data compression - Optimal nonlinear filtering*

FUZZY CONTROL SYSTEMS DESIGN AND ANALYSIS

A LINEAR MATRIX INEQUALITY APPROACH

John Wiley & Sons *A comprehensive treatment of model-based fuzzy controlsystems This volume offers full coverage of the systematic framework forthe stability and design of nonlinear fuzzy control systems.Building on the Takagi-Sugeno fuzzy model, authors Tanaka and Wangaddress a number of important issues in fuzzy control systems,including stability analysis, systematic design procedures,incorporation of performance specifications, numericalimplementations, and practical applications. Issues that have not been fully treated in existing texts, suchas stability analysis, systematic design, and performance analysis;are crucial to the validity and applicability of fuzzy controlmethodology. Fuzzy Control Systems Design and Analysis addressesthese issues in the framework of parallel distributed compensation,a controller structure devised in accordance with the fuzzymodel. This balanced treatment features an overview of fuzzy control,modeling, and stability analysis, as well as a section on the useof linear matrix inequalities (LMI) as an approach to fuzzy designand control. It also covers advanced topics in model-based fuzzycontrol systems, including modeling and control of chaotic systems.Later sections offer practical examples in the form of detailedtheoretical and experimental studies of fuzzy control in roboticsystems and a discussion of future directions in the field. Fuzzy Control Systems Design and Analysis offersan advanced treatment of fuzzy control that makes a usefulreference for researchers and a reliable text for advanced graduatestudents in the field.*

FUZZY CONTROLLERS HANDBOOK

HOW TO DESIGN THEM, HOW THEY WORK

Newnes *Teaches how to design a fuzzy controller, includes theoretical fundamentals of fuzzy logic as well as practical aspects of fuzzy technology.*