

Direct Adaptive Control Theory And Applications

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Robust Adaptive Control - G.C. Goodwin 2014-05-23

The workshop brought together international experts in the field of robust adaptive control to present recent developments in the area. These indicated that the theory of adaptive control is moving closer to applications and is beginning to give realistic guidelines useful in practical situations. The proceedings also focused on the value of such practical features as filtering, normalization, deadzones and unification of robust control and adaptation.

Adaptive Control Systems - Chalam 2017-10-19

impossible to access. It has been widely scattered in papers, reports, and proceedings of symposia, with different authors employing different symbols and terms. But now there is a book that covers all aspects of this dynamic topic in a systematic manner. Featuring consistent terminology and compatible notation, and emphasizing unified strategies, Adaptive Control Systems provides a comprehensive, integrated account of basic concepts, analytical tools, algorithms, and a wide variety of application trends and techniques. Adaptive Control Systems deals not only with the two principal approaches model reference adaptive control and self-tuning regulators but also considers other adaptive strategies involving variable structure systems, reduced order schemes, predictive control, fuzzy logic, and more. In addition, it highlights a large number of practical applications in a range of fields from electrical to biomedical and aerospace engineering ...and includes coverage of industrial robots. The book identifies current trends in the development of adaptive control systems ...delineates areas for further research . . . and provides an invaluable bibliography of over 1,200 references to the literature. The first authoritative reference in this important area of work, Adaptive Control Systems is an essential information source for electrical and electronics, R&D, chemical, mechanical, aerospace, biomedical, metallurgical, marine, transportation, and power plant engineers. It is also useful as a text in professional society seminars and in-house training programs for personnel involved with the control of complex systems, and for graduate students engaged in the study of adaptive control systems.

Adaptive Control Systems - Gang Feng 1999-05-10

Adaptive control is no longer just an important theoretical field of study, but is also providing solutions to real-world problems. Adaptive techniques will transform the world of control. The leading world practitioners of adaptive control have contributed to this handbook which is the most important work yet in this field. Not only are techniques described in theory, but detailed control algorithms are given, making this a practical cookbook of adaptive control for both control professionals and practising engineers. The book presents the most advanced techniques and algorithms of adaptive control. These include various robust techniques, performance enhancement techniques, techniques with less a-priori knowledge, nonlinear adaptive control techniques and intelligent adaptive techniques. Each technique described has been developed to provide a practical solution to a real-life problem. This volume will therefore not only advance the field of adaptive control as an area of study, but will also show how the potential of this technology can be realised and offer significant benefits. Practical cookbook of adaptive control Contains important research

Adaptive Control with Recurrent High-order Neural Networks - George A. Rovithakis 2000

The primary purpose of this book is to present a set of techniques which allow the design of controllers able to guarantee stability, convergence and robustness for dynamical systems with unknown nonlinearities and of manufacturing systems. To compensate for the significant amount of uncertainty in system structure, a neural network model developed recently, namely the Recurrent High Order Neural Network (RHONN), is employed. Real applications are provided with illustrations and tables for clarification; the book contains material on: - RHONN structure and approximation capabilities - indirect adaptive control - direct adaptive

control - scheduling for manufacturing systems - test case for scheduling using RHONNs. The book is primarily intended for industrial and institutional practitioners but should be of significant interest to undergraduate and graduate students and academic scientists working with neural networks and their applications in engineering.

Model-Reference Adaptive Control - Nhan T. Nguyen 2018-03-01

This textbook provides readers with a good working knowledge of adaptive control theory through applications. It is intended for students beginning masters or doctoral courses, and control practitioners wishing to get up to speed in the subject expeditiously. Readers are taught a wide variety of adaptive control techniques starting with simple methods and extending step-by-step to more complex ones. Stability proofs are provided for all adaptive control techniques without obfuscating reader understanding with excessive mathematics. The book begins with standard model-reference adaptive control (MRAC) for first-order, second-order, and multi-input, multi-output systems. Treatment of least-squares parameter estimation and its extension to MRAC follow, helping readers to gain a different perspective on MRAC. Function approximation with orthogonal polynomials and neural networks, and MRAC using neural networks are also covered. Robustness issues connected with MRAC are discussed, helping the student to appreciate potential pitfalls of the technique. This appreciation is encouraged by drawing parallels between various aspects of robustness and linear time-invariant systems wherever relevant. Following on from the robustness problems is material covering robust adaptive control including standard methods and detailed exposition of recent advances, in particular, the author's work on optimal control modification. Interesting properties of the new method are illustrated in the design of adaptive systems to meet stability margins. This method has been successfully flight-tested on research aircraft, one of various flight-control applications detailed towards the end of the book along with a hybrid adaptive flight control architecture that combines direct MRAC with least-squares indirect adaptive control. In addition to the applications, understanding is encouraged by the use of end-of-chapter exercises and associated MATLAB® files. Readers will need no more than the standard mathematics for basic control theory such as differential equations and matrix algebra; the book covers the foundations of MRAC and the necessary mathematical preliminaries.

Applications of Adaptive Control - Kumpati S. Narendra 2012-12-02

Control Applications of Adaptive covers the proceedings of the 197 Workshop on Applications of Adaptive Control, held in Yale University. This book is organized into five parts encompassing 18 chapters that summarize the potential application of adaptive control to many practical problems. Part I contains tutorials that bring together important results in two of the most studied approaches to adaptive control, namely, self-tuning regulators and model reference adaptive control (MRAC), with a particular emphasis on the importance of error models in the stability analysis of MRAC. Part II examines the algorithms used for adaptive signal processing, while Part III describes the types of power systems problems that could benefit from application of adaptive control and how to apply adaptive control algorithms for controlling large electric generators. Part IV highlights adaptive control in aircraft systems. This part also considers how adaptive control fell into disfavor in the flight control community, illustrating the existence of residual negative bias. The desirability of cost elimination of air data sensors in less-sophisticated flight control systems is also discussed. Part V addresses the application of process control to chemical processes and to electromechanical systems. This part also shows the robustness and superior tracking and regulation properties of model reference adaptive control applied to liquid level control. Discussion on various classes of model reference adaptive controllers in a common framework from the viewpoint of microcomputer implementation is also included. This book will be of value to control system theorists and practitioners.

Fuzzy Logic and Intelligent Systems - Hua Harry Li 2007-07-07

One of the attractions of fuzzy logic is its utility in solving many real engineering problems. As many have realised, the major obstacles in building a real intelligent machine involve dealing with random disturbances, processing large amounts of imprecise data, interacting with a dynamically changing environment, and coping with uncertainty. Neural-fuzzy techniques help one to solve many of these problems. *Fuzzy Logic and Intelligent Systems* reflects the most recent developments in neural networks and fuzzy logic, and their application in intelligent systems. In addition, the balance between theoretical work and applications makes the book suitable for both researchers and engineers, as well as for graduate students.

Dissipative Systems Analysis and Control - Bernard Brogliato 2019-07-03
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.

Robust and Adaptive Control - Eugene Lavretsky 2012-11-13

Robust and Adaptive Control shows the reader how to produce consistent and accurate controllers that operate in the presence of uncertainties and unforeseen events. Driven by aerospace applications the focus of the book is primarily on continuous-dynamical systems. The text is a three-part treatment, beginning with robust and optimal linear control methods and moving on to a self-contained presentation of the design and analysis of model reference adaptive control (MRAC) for nonlinear uncertain dynamical systems. Recent extensions and modifications to MRAC design are included, as are guidelines for combining robust optimal and MRAC controllers. Features of the text include: · case studies that demonstrate the benefits of robust and adaptive control for piloted, autonomous and experimental aerial platforms; · detailed background material for each chapter to motivate theoretical developments; · realistic examples and simulation data illustrating key features of the methods described; and · problem solutions for instructors and MATLAB® code provided electronically. The theoretical content and practical applications reported address real-life aerospace problems, being based on numerous transitions of control-theoretic results into operational systems and airborne vehicles that are drawn from the authors' extensive professional experience with The Boeing Company. The systems covered are challenging, often open-loop unstable, with uncertainties in their dynamics, and thus requiring both persistently reliable control and the ability to track commands either from a pilot or a guidance computer. Readers are assumed to have a basic understanding of root locus, Bode diagrams, and Nyquist plots, as well as linear algebra, ordinary differential equations, and the use of state-space methods in analysis and modeling of dynamical systems. *Robust and Adaptive Control* is intended to methodically teach senior undergraduate and graduate students how to construct stable and predictable control algorithms for realistic industrial applications. Practicing engineers and academic researchers will also find the book of great instructional value.

Agents and Artificial Intelligence - Joaquim Filipe 2011-03-07

This book constitutes the thoroughly refereed post-conference proceedings of the Second International Conference on Agents and Artificial Intelligence, ICAART 2010, held in Valencia, Spain, in January 2010. The 17 revised full papers presented together with an invited paper were carefully reviewed and selected from 364 submissions. Same as the conference the papers are organized in two simultaneous tracks: Artificial Intelligence and Agents. The selected papers reflect the interdisciplinary nature of the conference. The diversity of topics is an important feature of this conference, enabling an overall perception of several important scientific and technological trends.

Adaptive Control - Karl J. Åström 2013-04-26

Suitable for advanced undergraduates and graduate students, this overview introduces theoretical and practical aspects of adaptive control, with emphasis on deterministic and stochastic viewpoints. 1995 edition.

Adaptive Systems in Control and Signal Processing 1986 - K.J. Åström 2016-07-21

This second IFAC workshop discusses the variety and applications of adaptive systems in control and signal processing. The various approaches to adaptive control systems are covered and their stability and adaptability analyzed. The volume also includes papers taken from two poster sessions to give a concise and comprehensive

overview/treatment of this increasingly important field.

Direct Adaptive Control Algorithms: - Howard Kaufman 2012-12-06

Suitable either as a reference or as a text for a graduate course in adaptive control systems, this book is a self-contained compendium of easily implementable adaptive control algorithms that have been developed and applied by the authors for over 10 years. These algorithms do not require explicit process parameter identification and have been successfully applied to a wide variety of engineering problems including flexible structure control, blood pressure control and robotics. In general, these algorithms are suitable for a wide class of multiple input-output control systems containing significant uncertainty as well as disturbances.

Smart Civil Structures - You-Lin Xu 2017-04-11

A smart civil structure integrates smart materials, sensors, actuators, signal processors, communication networks, power sources, diagonal strategies, control strategies, repair strategies, and life-cycle management strategies. It should function optimally and safely in its environment and maintain structural integrity during strong winds, severe earthquakes, and other extreme events. This book extends from the fundamentals to the state-of-the-art. It covers the elements of smart civil structures, their integration, and their functions. The elements consist of smart materials, sensors, control devices, signal processors, and communication networks. Integration refers to multi-scale modelling and model updating, multi-type sensor placement, control theory, and collective placement of control devices and sensors. And the functions include structural health monitoring, structural vibration control, structural self-repairing, and structural energy harvesting, with emphasis on their synthesis to form truly smart civil structures. It suits civil engineering students, professionals, and researchers with its blend of principles and practice.

Advances in Variable Structure Systems - Xinghuo Yu 2000-11-14

The last of such a workshop in the 20th Century, this workshop aims not only to summarize the state-of-the-art developments in VSS theory and applications, but also identify new promising directions perceived as being important for VSS in the 21st century. The 20th Century has witnessed the formation and consolidation of VSS theory and its applications. It has also witnessed an emerging trend of cross-fertilization and integration of VSS with other control and non-control areas such as feedback linearization, flatness, passivity based control, adaptive control, system identification, pulse width modulation, Hinf, geometric and algebraic methods, artificial intelligence, modelling and optimisation, neural networks, fuzzy logic, etc. This trend will continue and flourish in the new millennium. Special features of the book include a survey paper entitled "VSS Premise of XX Century: Evidences of a Witness" by the father of VSS theory Professor Vadim Utkin and other articles by many authoritative experts in VSS. Contents: Discrete Variable Structure Control Robot Control with Variable Structure Output Variable Structure Control Second Order Sliding Mode Control Variable Structure Systems and Control Integration Variable Structure Control Theory Variable Structure Control Applications Readership: Academics, researchers, scientists and postgraduate students interested in variable structure systems. Keywords:

Robust Adaptive Control - Petros Ioannou 2013-09-26

Presented in a tutorial style, this comprehensive treatment unifies, simplifies, and explains most of the techniques for designing and analyzing adaptive control systems. Numerous examples clarify procedures and methods. 1995 edition.

Advances in Aerospace Guidance, Navigation and Control - Florian Holzapfel 2011-03-15

Over the last few decades, both the aeronautics and space disciplines have greatly influenced advances in controls, sensors, data fusion and navigation. Many of those achievements that made the word "aerospace" synonymous with "high-tech" were enabled by innovations in guidance, navigation and control. Europe has seen a strong trans-national consolidation process in aerospace over the last few decades. Most of the visible products, like commercial aircraft, fighters, helicopters, satellites, launchers or missiles, are not made by a single country - they are the fruits of cooperation. No European country by itself hosts a specialized guidance, navigation and controls community large enough to cover the whole spectrum of disciplines. However, on a European scale, mutual exchange of ideas, concepts and solutions is enriching for all. The 1st CEAS Specialist Conference on Guidance, Navigation and Control is an attempt to bring this community together. This book is a selection of papers presented at the conference. All submitted papers have gone through a formal review process in compliance with good journal

practices. The best papers have been recommended by the reviewers to be published in this book.

Control of Complex Systems - Kyriakos Vamvoudakis 2016-07-27

In the era of cyber-physical systems, the area of control of complex systems has grown to be one of the hardest in terms of algorithmic design techniques and analytical tools. The 23 chapters, written by international specialists in the field, cover a variety of interests within the broader field of learning, adaptation, optimization and networked control. The editors have grouped these into the following 5 sections: "Introduction and Background on Control Theory", "Adaptive Control and Neuroscience", "Adaptive Learning Algorithms", "Cyber-Physical Systems and Cooperative Control", "Applications". The diversity of the research presented gives the reader a unique opportunity to explore a comprehensive overview of a field of great interest to control and system theorists. This book is intended for researchers and control engineers in machine learning, adaptive control, optimization and automatic control systems, including Electrical Engineers, Computer Science Engineers, Mechanical Engineers, Aerospace/Automotive Engineers, and Industrial Engineers. It could be used as a text or reference for advanced courses in complex control systems. • Collection of chapters from several well-known professors and researchers that will showcase their recent work • Presents different state-of-the-art control approaches and theory for complex systems • Gives algorithms that take into consideration the presence of modelling uncertainties, the unavailability of the model, the possibility of cooperative/non-cooperative goals and malicious attacks compromising the security of networked teams • Real system examples and figures throughout, make ideas concrete Includes chapters from several well-known professors and researchers that showcases their recent work Presents different state-of-the-art control approaches and theory for complex systems Explores the presence of modelling uncertainties, the unavailability of the model, the possibility of cooperative/non-cooperative goals, and malicious attacks compromising the security of networked teams Serves as a helpful reference for researchers and control engineers working with machine learning, adaptive control, and automatic control systems

Decision Management: Concepts, Methodologies, Tools, and Applications - Management Association, Information Resources 2017-01-30

The implementation of effective decision making protocols is crucial in any organizational environment in modern society. Emerging advancements in technology and analytics have optimized uses and applications of decision making systems. *Decision Management: Concepts, Methodologies, Tools, and Applications* is a compendium of the latest academic material on the control, support, usage, and strategies for implementing efficient decision making systems across a variety of industries and fields. Featuring comprehensive coverage on numerous perspectives, such as data visualization, pattern analysis, and predictive analytics, this multi-volume book is an essential reference source for researchers, academics, professionals, managers, students, and practitioners interested in the maintenance and optimization of decision management processes.

Adaptive Control - Ioan Doré Landau 2013-08-03

Adaptive Control (second edition) shows how a desired level of system performance can be maintained automatically and in real time, even when process or disturbance parameters are unknown and variable. It is a coherent exposition of the many aspects of this field, setting out the problems to be addressed and moving on to solutions, their practical significance and their application. Discrete-time aspects of adaptive control are emphasized to reflect the importance of digital computers in the application of the ideas presented. The second edition is thoroughly revised to throw light on recent developments in theory and applications with new chapters on: multimodel adaptive control with switching, direct and indirect adaptive regulation and adaptive feedforward disturbance compensation. Many algorithms are newly presented in MATLAB® m-file format to facilitate their employment in real systems. Classroom-tested slides for instructors to use in teaching this material are also now provided. All of this supplementary electronic material can be downloaded from fill in URL. The core material is also up-dated and re-edited to keep its perspective in line with modern ideas and more closely to associate algorithms with their applications giving the reader a solid grounding in: synthesis and analysis of parameter adaptation algorithms, recursive plant model identification in open and closed loop, robust digital control for adaptive control; • robust parameter adaptation algorithms, practical considerations and applications, including flexible transmission systems, active vibration control and broadband disturbance rejection and a supplementary introduction on hot dip

galvanizing and a phosphate drying furnace. Control researchers and applied mathematicians will find *Adaptive Control* of significant and enduring interest and its use of example and application will appeal to practitioners working with unknown- and variable-parameter plant. Praise for the first edition: ...well written, interesting and easy to follow, so that it constitutes a valuable addition to the monographies in adaptive control for discrete-time linear systems... suitable (at least in part) for use in graduate courses in adaptive control.

Control and Dynamic Systems V25 - C.T. Leonides 2012-12-02

Control and Dynamic Systems: Advances in Theory and Application, Volume 25: System Identification and Adaptive Control, Part 1 of 3 deals with system parameter identification and adaptive control. It presents useful techniques for effective stochastic adaptive control systems. This book discusses multicriteria optimization in adaptive and stochastic control systems. After discussing how to estimate the parameters of an autoregressive moving-average (ARMA) process, it identifies instrumental variable methods for ARMA models. This book also presents robust algorithms for adaptive control; design principles for robustness in adaptive identification methods; utilization of robust smoothing; and order reduction of linear systems. This volume is a useful reference for control systems theorists and practitioners interested in system identification and adaptive control techniques.

Adaptive and Learning Systems - Kumpati S. Narendra 2013-11-22

This volume offers a glimpse of the status of research in adaptive and learning systems in 1985. In recent years these areas have spawned a multiplicity of ideas so rapidly that the average research worker or practicing engineer is overwhelmed by the flood of information. The Yale Workshop on Applications of Adaptive Systems Theory was organized in 1979 to provide a brief respite from this deluge, wherein critical issues may be examined in a calm and collegial environment. The fourth of the series having been held in May 1985, it has now become well established as a biennial forum for the lively exchange of ideas in the ever changing domain of adaptive systems. The scope of this book is broad and ranges from theoretical investigations to practical applications. It includes twenty eight papers by leaders in the field, selected from the Proceedings of the Fourth Yale Workshop and divided into five sections. I have provided a brief introduction to each section so that it can be read as a self-contained unit. The first section, devoted to adaptive control theory, suggests the intensity of activity in the field and reveals signs of convergence towards some common themes by workers with rather different motivation. Preliminary results concerning the reduced order model problem are dramatically changing the way we view the field and bringing it closer to other areas such as robust linear control where major advances have been recently reported.

Learning-Based Adaptive Control - Mouhacine Benosman 2016-08-02

Adaptive control has been one of the main problems studied in control theory. The subject is well understood, yet it has a very active research frontier. This book focuses on a specific subclass of adaptive control, namely, learning-based adaptive control. As systems evolve during time or are exposed to unstructured environments, it is expected that some of their characteristics may change. This book offers a new perspective about how to deal with these variations. By merging together Model-Free and Model-Based learning algorithms, the author demonstrates, using a number of mechatronic examples, how the learning process can be shortened and optimal control performance can be reached and maintained. Includes a good number of Mechatronics Examples of the techniques. Compares and blends Model-free and Model-based learning algorithms. Covers fundamental concepts, state-of-the-art research, necessary tools for modeling, and control.

Adaptive Control - Shankar Sastry 2011-01-01

This volume surveys the major results and techniques of analysis in the field of adaptive control. Focusing on linear, continuous time, single-input, single-output systems, the authors offer a clear, conceptual presentation of adaptive methods, enabling a critical evaluation of these techniques and suggesting avenues of further development. 1989 edition.

L1 Adaptive Control Theory - Naira Hovakimyan 2010-09-30

Contains results not yet published in technical journals and conference proceedings.

Analysis and Control of Industrial Processes - Dobrivoje Popović 2012-12-06

This book is an outcome of a 2-days Workshop on Automation Engineering held in Salzhausen (near Hamburg), F.R. Germany. The Workshop is annually organized by the Institute of Automation Technology and the Institute of Applied and Physical Chemistry of the University of Bremen. It is regularly joined by 30 to 40 participants

representing the teaching and research staff of both Institutes, as well as some invited colleagues from other universities and the regional industry. Usually 15/20 selected contributions, grouped in technical sessions (system modelling and identification, control systems design, computer hardware and software, knowledge-based systems, robotics etc.), are presented at the Workshop, whereby the invited guests preferably present survey papers on current problems of modern systems engineering. For this book, 22 papers, contributed to the last two Workshops, are selected and grouped into 6 Chapters. The Chapters reflect the technical sessions listed above and give an average view on current research activities at both Institutes of the University. It is expected that the book will prove as a useful reference to the scientists and practicing engineers in the area of development and application of methods of modern systems engineering in processing industry and the robotics.

Fuzzy Controller Design - Zdenko Kovacic 2018-10-08

Fuzzy control methods are critical for meeting the demands of complex nonlinear systems. They bestow robust, adaptive, and self-correcting character to complex systems that demand high stability and functionality beyond the capabilities of traditional methods. A thorough treatise on the theory of fuzzy logic control is out of place on the design bench. That is why *Fuzzy Controller Design: Theory and Applications* offers laboratory- and industry-tested algorithms, techniques, and formulations of real-world problems for immediate implementation. With surgical precision, the authors carefully select the fundamental elements of fuzzy logic control theory necessary to formulate effective and efficient designs. The book supplies a springboard of knowledge, punctuated with examples worked out in MATLAB®/SIMULINK®, from which newcomers to the field can dive directly into applications. It systematically covers the design of hybrid, adaptive, and self-learning fuzzy control structures along with strategies for fuzzy controller design suitable for on-line and off-line operation. Examples occupy an entire chapter, with a section devoted to the simulation of an electro-hydraulic servo system. The final chapter explores industrial applications with emphasis on techniques for fuzzy controller implementation and different implementation platforms for various applications. With proven methods based on more than a decade of experience, *Fuzzy Controller Design: Theory and Applications* is a concise guide to the methodology, design steps, and formulations for effective control solutions.

System Identification and Adaptive Control - Yiannis Boutalis 2014-04-23

Presenting current trends in the development and applications of intelligent systems in engineering, this monograph focuses on recent research results in system identification and control. The recurrent neurofuzzy and the fuzzy cognitive network (FCN) models are presented. Both models are suitable for partially-known or unknown complex time-varying systems. Neurofuzzy Adaptive Control contains rigorous proofs of its statements which result in concrete conclusions for the selection of the design parameters of the algorithms presented. The neurofuzzy model combines concepts from fuzzy systems and recurrent high-order neural networks to produce powerful system approximations that are used for adaptive control. The FCN model stems from fuzzy cognitive maps and uses the notion of “concepts” and their causal relationships to capture the behavior of complex systems. The book shows how, with the benefit of proper training algorithms, these models are potent system emulators suitable for use in engineering systems. All chapters are supported by illustrative simulation experiments, while separate chapters are devoted to the potential industrial applications of each model including projects in: • contemporary power generation; • process control and • conventional benchmarking problems. Researchers and graduate students working in adaptive estimation and intelligent control will find Neurofuzzy Adaptive Control of interest both for the currency of its models and because it demonstrates their relevance for real systems. The monograph also shows industrial engineers how to test intelligent adaptive control easily using proven theoretical results.

Advanced Intelligent Computing Theories and Applications. With Aspects of Artificial Intelligence - De-Shuang Huang 2008-08-28

The International Conference on Intelligent Computing (ICIC) was formed to provide 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 industry 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.

Adaptive Control - Kwanho You 2009-01-01

Adaptive control has been a remarkable field for industrial and academic research since 1950s. Since more and more adaptive algorithms are applied in various control applications, it is becoming very important for practical implementation. As it can be confirmed from the increasing number of conferences and journals on adaptive control topics, it is certain that the adaptive control is a significant guidance for technology development. The authors the chapters in this book are professionals in their areas and their recent research results are presented in this book which will also provide new ideas for improved performance of various control application problems.

Adaptive Dual Control - Nikolai Michailovich Filatov 2004-04-20

This monograph demonstrates how the performance of various well-known adaptive controllers can be improved significantly using the dual effect. The modifications to incorporate dual control are realized separately and independently of the main adaptive controller without complicating the algorithms. A new bicriterial approach for dual control is developed and applied to various types of popular linear and nonlinear adaptive controllers. Practical applications of the designed controllers to several real-time problems are presented. This monograph is the first book providing a complete exposition on the dual control problem from the inception in the early 1960s to the present state of the art aiming at students and researchers in adaptive control as well as design engineers in industry.

Adaptive Control - Rogelio Lozano 2012-12-06

Adaptive Control provides techniques for automatic, real-time adjustments in controller parameters with a view to achieving and/or maintaining a desirable level of system performance in the presence of unknown or variable process parameters. Many aspects of the field are dealt with in coherent and orderly fashion, starting with the problems posed by system uncertainties and moving on to the presentation of solutions and their practical significance. Within the general context of recent developments, the book looks at: • synthesis and analysis of parameter adaptation algorithms; • recursive plant-model identification in open and closed loop; • robust digital control for adaptive control; • direct and indirect adaptive control; and • practical aspects and applications. To reflect the importance of digital computers for the application of adaptive control techniques, discrete-time aspects are emphasized. To guide the reader, the book contains various applications of adaptive control techniques.

Monitoring and Control of Information-Poor Systems - Arthur L. Dexter 2012-02-16

The monitoring and control of a system whose behaviour is highly uncertain is an important and challenging practical problem. Methods of solution based on fuzzy techniques have generated considerable interest, but very little of the existing literature considers explicit ways of taking uncertainties into account. This book describes an approach to the monitoring and control of information-poor systems that is based on fuzzy relational models which generate fuzzy outputs. The first part of *Monitoring and Control of Information-Poor Systems* aims to clarify why design decisions must take account of the uncertainty associated with optimal choices, and to explain how a fuzzy relational model can be used to generate a fuzzy output, which reflects the uncertainties associated with its predictions. Part two gives a brief introduction to fuzzy decision-making and shows how it can be used to design a predictive control scheme that is suitable for controlling information-poor systems using inaccurate measurements. Part three describes different ways in which fuzzy relational models can be generated online and explains the practical issues associated with their identification and application. The final part of the book provides examples of the use of the previously described techniques in real applications. Key features: Describes techniques applicable to a wide range of engineering, environmental, medical, financial and economic applications Uses simple examples to help explain the basic techniques for dealing with uncertainty Describes

a novel design approach based on the use of fuzzy relational models. Considers practical issues associated with applying the techniques to real systems. Monitoring and Control of Information-Poor Systems forms an invaluable resource for a wide range of graduate students, and is also a comprehensive reference for researchers and practitioners working on problems involving mathematical modelling and control.

Direct Adaptive Control Algorithms - Howard Kaufman 2012-12-06
Suitable either as a reference for practising engineers or as a text for a graduate course in adaptive control systems, this is a self-contained compendium of readily implementable adaptive control algorithms. These algorithms have been developed and applied by the authors for over fifteen years to a wide variety of engineering problems including flexible structure control, blood pressure control, and robotics. As such, they are suitable for a wide variety of multiple input-output control systems with uncertainty and external disturbances. The text is intended to enable anyone with knowledge of basic linear multivariable systems to adapt the algorithms to problems in a wide variety of disciplines. Thus, in addition to developing the theoretical details of the algorithms presented, the text gives considerable emphasis to designing algorithms and to representative applications in flight control, flexible structure control, robotics, and drug-infusion control. This second edition makes good use of MATLAB programs for the illustrative examples; these programs are described in the text and can be obtained from the MathWorks file server.

Adaptive and Intelligent Control of Microbial Fuel Cells - Ravi Patel 2019-04-16

This book addresses a range of solutions and effective control techniques for Microbial Fuel Cells (MFCs), intended as a response to the increased energy consumption and wastewater production stemming from globalization. It describes the fundamentals of MFCs and control-oriented mathematical models, and provides detailed information on uncertain parameters. Various control techniques like robust control with LMI, adaptive backstepping control, and exact linearization control are developed for different mathematical models. In turn, the book elaborates on the basics of adaptive control, presenting several methods in detail. It also demonstrates how MFCs can be developed at the laboratory level, equipping readers to develop their own MFCs for experimental purposes. In closing, it develops a transfer function model for MFCs by combining a system identification technique and model reference adaptive control techniques. By addressing one of the most promising sources of clean and renewable energy, this book provides a viable solution for meeting the world's increasing energy demands.

Digital Computer Applications to Process Control - M. Paul 2016-11-04
Considers the application of modern control engineering on digital computers with a view to improving productivity and product quality, easing supervision of industrial processes and reducing energy consumption and pollution. The topics covered may be divided into two main subject areas: (1) applications of digital control - in the chemical and oil industries, in water turbines, energy and power systems, robotics and manufacturing, cement, metallurgical processes, traffic control, heating and cooling; (2) systems theoretical aspects of digital control - adaptive systems, control aspects, multivariable systems, optimization and reliability, modelling and identification, real-time software and languages, distributed systems and data networks. Contains 84 papers.

Model Free Adaptive Control - Zhongsheng Hou 2013-09-24
Model Free Adaptive Control: Theory and Applications summarizes theory and applications of model-free adaptive control (MFAC). MFAC is a novel adaptive control method for the unknown discrete-time nonlinear systems with time-varying parameters and time-varying structure, and the design and analysis of MFAC merely depend on the measured input and output data of the controlled plant, which makes it more applicable for many practical plants. This book covers new concepts, including pseudo partial derivative, pseudo gradient, pseudo Jacobian matrix, and generalized Lipschitz conditions, etc.; dynamic linearization approaches for nonlinear systems, such as compact-form dynamic linearization,

partial-form dynamic linearization, and full-form dynamic linearization; a series of control system design methods, including MFAC prototype, model-free adaptive predictive control, model-free adaptive iterative learning control, and the corresponding stability analysis and typical applications in practice. In addition, some other important issues related to MFAC are also discussed. They are the MFAC for complex connected systems, the modularized controller designs between MFAC and other control methods, the robustness of MFAC, and the symmetric similarity for adaptive control system design. The book is written for researchers who are interested in control theory and control engineering, senior undergraduates and graduated students in engineering and applied sciences, as well as professional engineers in process control.

Intelligent Adaptive Control - Lakhmi C. Jain 1998-12-29
This book describes important techniques, developments, and applications of computational intelligence in system control. Chapters present: an introduction to the fundamentals of neural networks, fuzzy logic, and evolutionary computing a rigorous treatment of intelligent control industrial applications of intelligent control and soft computing, including transportation, petroleum, motor drive, industrial automation, and fish processing other knowledge-based techniques, including vehicle driving aid and air traffic management Intelligent Adaptive Control provides a state-of-the-art treatment of practical applications of computational intelligence in system control. The book cohesively covers introductory and advanced theory, design, implementation, and industrial use - serving as a singular resource for the theory and application of intelligent control, particularly employing fuzzy logic, neural networks, and evolutionary computing.

Adaptive Control Design and Analysis - Gang Tao 2003-07-09
A systematic and unified presentation of the fundamentals of adaptive control theory in both continuous time and discrete time Today, adaptive control theory has grown to be a rigorous and mature discipline. As the advantages of adaptive systems for developing advanced applications grow apparent, adaptive control is becoming more popular in many fields of engineering and science. Using a simple, balanced, and harmonious style, this book provides a convenient introduction to the subject and improves one's understanding of adaptive control theory. Adaptive Control Design and Analysis features: Introduction to systems and control Stability, operator norms, and signal convergence Adaptive parameter estimation State feedback adaptive control designs Parametrization of state observers for adaptive control Unified continuous and discrete-time adaptive control L1+ a robustness theory for adaptive systems Direct and indirect adaptive control designs Benchmark comparison study of adaptive control designs Multivariate adaptive control Nonlinear adaptive control Adaptive compensation of actuator nonlinearities End-of-chapter discussion, problems, and advanced topics As either a textbook or reference, this self-contained tutorial of adaptive control design and analysis is ideal for practicing engineers, researchers, and graduate students alike.

Dissipative Systems Analysis and Control - Rogelio Lozano 2013-03-14
This book deals with the analysis and feedback control of dissipative dynamical systems. It presents the background of dissipative systems theory. Linear as well as nonlinear systems are treated, and many examples are given throughout the chapters. Some infinite dimensional and non-smooth examples are also included. The emphasis is put on the application towards the design of stable feedback control laws. Then the theory is illustrated on physical examples; (Lagrangian and Hamiltonian systems are thoroughly studied, as well as adaptive control). It is shown how the dissipativity properties of a system can be used in the design of stable feedback controllers. Some experimental results are presented which corroborate the theoretical developments. This monograph is primarily for readers who wish to get acquainted with Dissipative Systems Theory, and its uses in Systems and Control and Robotics. It constitutes an advanced introduction to the topic, and is the first volume ever published which is dedicated entirely to this subject.