Intelligent Control Aspects Of Fuzzy Logic And Neural Nets World Scientific Series In Robotics And Automated Systems

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An Introduction to Fuzzy Control Dimiter Driankov 2013-03-09 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.

Intelligent Control Nazmul Siddique 2013-11-29 Intelligent Control considers non-traditional modelling and control approaches to nonlinear systems. Fuzzy logic, neural networks and evolutionary computing techniques are the main tools used. The book presents a modular switching fuzzy logic controller where a PD-type fuzzy controller is executed first followed by a PI-type fuzzy controller thus improving the performance of the controller compared with a PID-type fuzzy controller. The advantage of the switching-type fuzzy controller is that it uses one

rule-base thus minimises the rule-base during execution. A single rule-base is developed by merging the membership functions for change of error of the PD-type controller and sum of error of the PI-type controller. Membership functions are then optimized using evolutionary algorithms. Since the two fuzzy controllers were executed in series, necessary further tuning of the differential and integral scaling factors of the controller is then performed. Neural-network-based tuning for the scaling parameters of the fuzzy controller is then described and finally an evolutionary algorithm is applied to the neurally-tuned-fuzzy controller in which the sigmoidal function shape of the neural network is determined. The important issue of stability is addressed and the text demonstrates empirically that the developed controller was stable within the operating range. The text concludes with ideas for future research to show the reader the potential for further study in this area. Intelligent Control will be of interest to researchers from engineering and computer science backgrounds working in the intelligent and adaptive control.

Fuzzy Logic, Identification and Predictive Control Jairo Jose Espinosa Oviedo 2006-03-30 Modern industrial processes and systems require adaptable advanced control protocols able to deal with circumstances demanding "judgement" rather than simple "yes/no", "on/off" responses: circumstances where a linguistic description is often more relevant than a cut-and-dried numerical one. The ability of fuzzy systems to handle numeric and linguistic information within a single framework renders them efficacious for this purpose. Fuzzy Logic, Identification and Predictive Control first shows you how to construct static and dynamic fuzzy models using the numerical data from a variety of real industrial systems and simulations. The second part exploits such models to design control systems employing techniques like data mining. This monograph presents a combination of fuzzy control theory and industrial serviceability that will make a telling contribution to your research whether in the academic or industrial sphere and also serves as a fine roundup of the fuzzy control area for the graduate student.

Fuzzy Logic Control H. B. Verbruggen 1999 Fuzzy logic control has become an important methodology in control engineering. This volume deals with applications of fuzzy logic control in various domains. The contributions are divided into three parts. The first part consists of two state-of-the-art tutorials on fuzzy control and fuzzy modeling. Surveys of advanced methodologies are included in the second part. These surveys address fuzzy decision making and control, fault detection, isolation and diagnosis, complexity reduction in fuzzy systems and neuro-fuzzy methods. The third part contains application-oriented contributions from various fields, such as process industry, cement and ceramics, vehicle control and traffic management, electromechanical and production systems, avionics, biotechnology and medical applications. The book is intended for researchers both from the academic world and from industry.

Industrial Intelligent Control Yong-Zai Lu 1996-05-01 With a strong emphasis on applications of intelligent control, this extremely accessible book covers the fundamentals, methodologies, architectures and algorithms of automatic control systems. The author summarizes several current concepts to improve industrial control systems, combining classical control techniques of dynamic modeling and control with new approaches discussed in the text. Addresses such intelligent systems as neural networks, fuzzy logic, ruled based, and genetic algorithms. Demonstrates how to develop, design and use intelligent systems to solve sophisticated industrial control problems. Includes numerous worked application examples.

Intelligent Control Systems with an Introduction to System of Systems Engineering Thrishantha Nanayakkara 2018-09-03 From aeronautics and manufacturing to healthcare and disaster management, systems engineering (SE) now focuses on designing applications that ensure performance optimization, robustness, and reliability while combining an emerging group of heterogeneous systems to realize a common goal. Use SoS to Revolutionize Management of Large Organizations, Factories, and Systems Intelligent Control Systems with an Introduction to System of Systems Engineering integrates the fundamentals of artificial intelligence and systems control in a framework applicable to both simple dynamic systems and large-scale system of systems (SoS). For decades, NASA has used SoS methods, and major manufacturers—including Boeing,

Lockheed-Martin, Northrop-Grumman, Raytheon, BAE Systems—now make large-scale systems integration and SoS a key part of their business strategies, dedicating entire business units to this remarkably efficient approach. Simulate Novel Robotic Systems and Applications Transcending theory, this book offers a complete and practical review of SoS and some of its fascinating applications, including: Manipulation of robots through neural-based network control Use of robotic swarms, based on ant colonies, to detect mines Other novel systems in which intelligent robots, trained animals, and humans cooperate to achieve humanitarian objectives Training engineers to integrate traditional systems control theory with soft computing techniques further nourishes emerging SoS technology. With this in mind, the authors address the fundamental precepts at the core of SoS, which uses human heuristics to model complex systems, providing a scientific rationale for integrating independent, complex systems into a single coordinated, stabilized, and optimized one. They provide readers with MATLAB® code, which can be downloaded from the publisher's website to simulate presented results and projects that offer practical, hands-on experience using concepts discussed throughout the book.

Type-2 Fuzzy Logic in Intelligent Control Applications Oscar Castillo 2011-11-08 We describe in this book, hybrid intelligent systems based mainly on type-2 fuzzy logic for intelligent control. Hybrid intelligent systems combine several intelligent computing paradigms, including fuzzy logic, and bio-inspired optimization algorithms, which can be used to produce powerful automatic control systems. The book is organized in three main parts, which contain a group of chapters around a similar subject. The first part consists of chapters with the main theme of theory and design algorithms, which are basically chapters that propose new models and concepts, which can be the basis for achieving intelligent control with interval type-2 fuzzy logic. The second part of the book is comprised of chapters with the main theme of evolutionary optimization of type-2 fuzzy systems in intelligent control with the aim of designing optimal type-2 fuzzy controllers for complex control problems in diverse areas of application, including mobile robotics, aircraft dynamics systems

and hardware implementations. The third part of the book is formed with chapters dealing with the theme of bio-inspired optimization of type-2 fuzzy systems in intelligent control, which includes the application of particle swarm intelligence and ant colony optimization algorithms for obtaining optimal type-2 fuzzy controllers.

Intelligent Control Design and MATLAB Simulation Jinkun Liu 2017-09-20 This book offers a comprehensive introduction to intelligent control system design, using MATLAB simulation to verify typical intelligent controller designs. It also uses real-world case studies that present the results of intelligent controller implementations to illustrate the successful application of the theory. Addressing the need for systematic design approaches to intelligent control system design using neural network and fuzzy-based techniques, the book introduces the concrete design method and MATLAB simulation of intelligent control strategies; offers a catalog of implementable intelligent control design methods for engineering applications; provides advanced intelligent controller design methods and their stability analysis methods; and presents a sample simulation and Matlab program for each intelligent control algorithm. The main topics addressed are expert control, fuzzy logic control, adaptive fuzzy control, neural network control, adaptive neural control and intelligent optimization algorithms, providing several engineering application examples for each method.

Intelligent Control Based on Fuzzy Logic and Neural Network Theory Chuen-Chien Lee 1990

Intelligent Control Systems with LabVIEWTM Pedro Ponce-Cruz 2009-10-23 Intelligent Control with LabVIEWTM is a fresh and pragmatic approach to the understanding of a subject often clouded by too much mathematical theory. It exploits the full suite of tools provided by LabVIEWTM, showing the student how to design, develop, analyze, and visualize intelligent control algorithms quickly and simply. Block diagrams are used to follow the progress of an algorithm through the design process and allow seamless integration with hardware systems for rapid deployment in laboratory experiments. This text delivers a thorough grounding in the main tools of intelligent control: fuzzy logic systems; artificial neural

networks; neuro-fuzzy systems; evolutionary methods; and predictive methods. Learning and teaching are facilitated by: extensive use of worked examples; end of chapter problems with separate solutions; and provision of intelligent control tools for LabVIEWTM.

Fuzzy Reasoning in Information, Decision and Control Systems S.G. Tzafestas 1994-02-28 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.

Neural and Fuzzy Logic Control of Drives and Power Systems Marcian Cirstea 2002-10-08 *Introduces cutting-edge control systems to a wide readership of engineers and students *The first book on neuro-fuzzy control systems to take a practical, applications-based approach, backed up with worked examples and case studies *Learn to use VHDL in real-world applications Introducing cutting edge control systems through real-world applications Neural networks and fuzzy logic based systems offer a modern control solution to AC machines used in variable speed drives, enabling industry to save costs and increase efficiency by replacing expensive and high-maintenance DC motor systems. The use of fast micros has revolutionised the field with sensorless vector control and direct torque control. This book reflects recent research findings and acts as a useful guide to the new generation of control systems for a wide readership of advanced undergraduate and graduate students, as well as practising engineers. The authors guide readers quickly and concisely through the complex topics of neural networks, fuzzy logic, mathematical modelling of electrical machines, power systems control and VHDL design. Unlike the academic monographs that have previously been published on each of these subjects, this book combines them and is based round case studies of systems analysis, control strategies, design, simulation and implementation. The result is a guide to applied control systems design that will appeal equally to students and professional design engineers. The book can also be used as a unique VHDL design aid, based on real-world power engineering applications.

Computational Intelligence and Optimization Methods for Control Engineering Maude Josée Blondin 2019-09-20 This volume presents some recent and principal developments related to computational intelligence and optimization methods in control. Theoretical aspects and practical applications of control engineering are covered by 14 self-contained contributions. Additional gems include the discussion of future directions and research perspectives designed to add to the reader's understanding of both the challenges faced in control engineering and the insights into the developing of new techniques. With the knowledge obtained, readers are encouraged to determine the appropriate control method for specific applications.

Aspects of Soft Computing, Intelligent Robotics and Control János Fodor 2009-10-13 Soft computing, as a collection of techniques exploiting approximation and tolerance for imprecision and uncertainty in traditionally intractable problems, has become very effective and popular especially because of the synergy derived from its components. The integration of constituent technologies provides complementary methods that allow developing flexible computing tools and solving complex problems. A wide area of natural applications of soft computing techniques consists of the control of dynamic systems, including robots. Loosely speaking, control can be understood as driving a process to attain a desired goal. Intelligent control can be seen as an extension of this concept, to include autonomous human-like interactions of a machine with the environment. Intelligent robots can be characterized by the ability to operate in an uncertain, changing environment with the help of

appropriate sensing. They have the power to autonomously plan and execute motion sequences to achieve a goal specified by a human user without detailed instructions. In this volume leading specialists address various theoretical and practical aspects in soft computing, intelligent robotics and control. The problems discussed are taken from fuzzy systems, neural networks, interactive evolutionary computation, intelligent mobile robotics, and intelligent control of linear and nonlinear dynamic systems.

Advances In Intelligent Control C J Harris 1994-03-11 "Advances in intelligent Control" is a collection of essays covering the latest research in the field. Based on a special issue of "The International Journal of Control", the book is arranged in two parts. Part one contains recent contributions of artificial neural networks to modelling and control. Part two concerns itself primarily with aspects of fuzzy logic in intelligent control, guidance and estimation, although some of the contributions either make direct equivalence relationships to neural networks or use hybrid methods where a neural network is used to develop the fuzzy rule base.

Intelligent Control Clarence W. de Silva 2018-05-02 The emergence of fuzzy logic and its applications has dramatically changed the face of industrial control engineering. Over the last two decades, fuzzy logic has allowed control engineers to meet and overcome the challenges of developing effective controllers for increasingly complex systems with poorly defined dynamics. Today's engineers need a working knowledge of the principles and techniques of fuzzy logic-Intelligent Control provides it. The author first introduces the traditional control techniques and contrasts them with intelligent control. He then presents several methods of representing and processing knowledge and introduces fuzzy logic as one such method. He highlights the advantages of fuzzy logic over other techniques, indicates its limitations, and describes in detail a hierarchical control structure appropriate for use in intelligent control systems. He introduces a variety of applications, most in the areas of robotics and mechatronics but with others including air conditioning and process/production control. One appendix provides discussion of some advanced analytical concepts of fuzzy logic, another describes a commercially available software system for developing fuzzy logic application. Intelligent Control is filled with worked examples, exercises, problems, and references. No prior knowledge of the subject nor advanced mathematics are needed to comprehend much of the book, making it well-suited as a senior undergraduate or first-year graduate text and a convenient reference tool for practicing professionals.

New Approaches in Intelligent Control Kazumi Nakamatsu 2016-06-02 This volume introduces new approaches in intelligent control area from both the viewpoints of theory and application. It consists of eleven contributions by prominent authors from all over the world and an introductory chapter. This volume is strongly connected to another volume entitled "New Approaches in Intelligent Image Analysis" (Eds. Roumen Kountchev and Kazumi Nakamatsu). The chapters of this volume are self-contained and include summary, conclusion and future works. Some of the chapters introduce specific case studies of various intelligent control systems and others focus on intelligent theory based control techniques with applications. A remarkable specificity of this volume is that three chapters are dealing with intelligent control based on paraconsistent logics.

Fuzzy Logic Applications in Engineering Science J. Harris 2006-01-17 Fuzzy logic is a relatively new concept in science applications. Hitherto, fuzzy logic has been a conceptual process applied in the field of risk management. Its potential applicability is much wider than that, however, and its particular suitability for expanding our understanding of processes and information in science and engineering in our post-modern world is only just beginning to be appreciated. Written as a companion text to the author's earlier volume "An Introduction to Fuzzy Logic Applications", the book is aimed at professional engineers and students and those with an interest in exploring the potential of fuzzy logic as an information processing kit with a wide variety of practical applications in the field of engineering science and develops themes and topics introduced in the author's earlier text.

Fuzzy Logic in Intelligent System Design Patricia Melin 2017-09-30 This book describes recent advances in the use of fuzzy logic for the design of

hybrid intelligent systems based on nature-inspired optimization and their applications in areas such as intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. Based on papers presented at the North American Fuzzy Information Processing Society Annual Conference (NAFIPS 2017), held in Cancun, Mexico from 16 to 18 October 2017, the book is divided into nine main parts, the first of which first addresses theoretical aspects, and proposes new concepts and algorithms based on type-1 fuzzy systems. The second part consists of papers on new concepts and algorithms for type-2 fuzzy systems, and on applications of type-2 fuzzy systems in diverse areas, such as time series prediction and pattern recognition. In turn, the third part contains papers that present enhancements to meta-heuristics based on fuzzy logic techniques describing new nature-inspired optimization algorithms that use fuzzy dynamic adaptation of parameters. The fourth part presents emergent intelligent models, which range from quantum algorithms to cellular automata. The fifth part explores applications of fuzzy logic in diverse areas of medicine, such as the diagnosis of hypertension and heart diseases. The sixth part describes new computational intelligence algorithms and their applications in different areas of intelligent control, while the seventh examines the use of fuzzy logic in different mathematic models. The eight part deals with a diverse range of applications of fuzzy logic, ranging from environmental to autonomous navigation, while the ninth covers theoretical concepts of fuzzy models

Type-2 Fuzzy Logic: Theory and Applications Oscar Castillo 2008-02-20 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.

Intelligent Control Based on Fuzzy Logic and Constraint Processing Ching-Yu Tyan 1995

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.

Safety, Reliability and Applications of Emerging Intelligent Control Technologies T.S. Ng 2014-06-28 Increasingly, over the last few years, intelligent controllers have been incorporated into control systems. Presently, the numbers and types of intelligent controllers that contain variations of fuzzy logic, neural network, genetic algorithms or some other forms of knowledge based reasoning technology are dramatically rising. However, considering the stability of the system, when such controllers are included it is difficult to analyse and predict system behaviour under unexpected conditions. Leading researchers and industrial practitioners were able to discuss and evaluate current development and future research directions at the first IFAC International Workshop on safety, reliability and applications on emerging intelligent control technology. This publication contains the papers, covering a wide range of topics, presented at the workshop.

Intelligent Control Systems Using Soft Computing Methodologies Ali Zilouchian 2001-03-27 In recent years, intelligent control has emerged as one of the most active and fruitful areas of research and development. Until now, however, there has been no comprehensive text that explores the subject with focus on the design and analysis of biological and industrial applications. Intelligent Control Systems Using Soft Computing Methodologies does all that and more. Beginning with an overview of intelligent control methodologies, the contributors present the fundamentals of neural networks, supervised and unsupervised learning,

and recurrent networks. They address various implementation issues, then explore design and verification of neural networks for a variety of applications, including medicine, biology, digital signal processing, object recognition, computer networking, desalination technology, and oil refinery and chemical processes. The focus then shifts to fuzzy logic, with a review of the fundamental and theoretical aspects, discussion of implementation issues, and examples of applications, including control of autonomous underwater vehicles, navigation of space vehicles, image processing, robotics, and energy management systems. The book concludes with the integration of genetic algorithms into the paradigm of soft computing methodologies, including several more industrial examples, implementation issues, and open problems and open problems related to intelligent control technology. Suitable as a textbook or a reference, Intelligent Control Systems explores recent advances in the field from both the theoretical and the practical viewpoints. It also integrates intelligent control design methodologies to give designers a set of flexible, robust controllers and provide students with a tool for solving the examples and exercises within the book.

An Introduction to Fuzzy Logic Applications in Intelligent Systems Ronald R. Yager 2012-12-06 An Introduction to Fuzzy Logic Applications in Intelligent Systems consists of a collection of chapters written by leading experts in the field of fuzzy sets. Each chapter addresses an area where fuzzy sets have been applied to situations broadly related to intelligent systems. The volume provides an introduction to and an overview of recent applications of fuzzy sets to various areas of intelligent systems. Its purpose is to provide information and easy access for people new to the field. The book also serves as an excellent reference for researchers in the field and those working in the specifics of systems development. People in computer science, especially those in artificial intelligence, knowledge-based systems, and intelligent systems will find this to be a valuable sourcebook. Engineers, particularly control engineers, will also have a strong interest in this book. Finally, the book will be of interest to researchers working in decision support systems, operations research, decision theory, management science and applied mathematics. An

Introduction to Fuzzy Logic Applications in Intelligent Systems may also be used as an introductory text and, as such, it is tutorial in nature.

Fuzzy Logic John Yen 1999 Providing equal emphasis on theoretical foundations and practical issues, this book features fuzzy logic concepts and techniques in intelligent systems, control, and information technology. Uses Fuzzy Logic Toolbox MATLAB to demonstrate exemplar applications and to develop hands-on exercises.

Fuzzy Logic Augmentation of Neural and Optimization Algorithms: Theoretical Aspects and Real Applications Oscar Castillo 2018-01-10 This book comprises papers on diverse aspects of fuzzy logic, neural networks, and nature-inspired optimization meta-heuristics and their application in various areas such as intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. The book is organized into seven main parts, each with a collection of papers on a similar subject. The first part presents new concepts and algorithms based on type-2 fuzzy logic for dynamic parameter adaptation in meta-heuristics. The second part discusses network theory and applications, and includes papers describing applications of neural networks in diverse areas, such as time series prediction and pattern recognition. The third part addresses the theory and practice of meta-heuristics in different areas of application, while the fourth part describes diverse fuzzy logic applications in the control area, which can be considered as intelligent controllers. The next two parts explore applications in areas, such as time series prediction, and pattern recognition and new optimization and evolutionary algorithms and their applications respectively. Lastly, the seventh part addresses the design and application of different hybrid intelligent systems.

Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems Guanrong Chen 2000-11-27 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

Type-2 Fuzzy Logic in Intelligent Control Applications Oscar Castillo 2011-10-18 We describe in this book, hybrid intelligent systems based mainly on type-2 fuzzy logic for intelligent control. Hybrid intelligent systems combine several intelligent computing paradigms, including fuzzy logic, and bio-inspired optimization algorithms, which can be used to produce powerful automatic control systems. The book is organized in three main parts, which contain a group of chapters around a similar subject. The first part consists of chapters with the main theme of theory and design algorithms, which are basically chapters that propose new models and concepts, which can be the basis for achieving intelligent control with interval type-2 fuzzy logic. The second part of the book is comprised of chapters with the main theme of evolutionary optimization of type-2 fuzzy systems in intelligent control with the aim of designing optimal type-2 fuzzy controllers for complex control problems in diverse areas of application, including mobile robotics, aircraft dynamics systems and hardware implementations. The third part of the book is formed with chapters dealing with the theme of bio-inspired optimization of type-2 fuzzy systems in intelligent control, which includes the application of particle swarm intelligence and ant colony optimization algorithms for obtaining optimal type-2 fuzzy controllers.
Fuzzy Logic in Control 1995
Intelligent Systems Bogdan M. Wilamowski 2018-10-03 The Industrial Electronics Handbook, Second Edition combines traditional and newer, more specialized knowledge that will help industrial electronics engineers develop practical solutions for the design and implementation of high-power applications. Embracing the broad technological scope of the field, this collection explores fundamental areas, including analog and digital circuits, electronics, electromagnetic machines, signal processing, and industrial control and communications systems. It also facilitates the use of intelligent systems—such as neural networks, fuzzy systems, and evolutionary methods—in terms of a hierarchical structure that makes factory control and supervision more efficient by addressing the needs of all production components. Enhancing its value, this fully updated collection presents research and global trends as published in the IEEE Transactions on Industrial Electronics Journal, one of the largest and most respected publications in the field. As intelligent systems continue to replace and sometimes outperform human intelligence in decision-making processes, they have made substantial contributions to the solution of very complex problems. As a result, the field of computational intelligence has branched out in several directions. For instance, artificial neural networks can learn how to classify patterns, such as images or sequences of events, and effectively model complex nonlinear systems. Simple and easy to implement, fuzzy systems can be applied to successful modeling and system control. Illustrating how these and other tools help engineers model nonlinear system behavior, determine and evaluate system parameters, and ensure overall system control, Intelligent Systems: Addresses various aspects of neural networks and fuzzy systems Focuses on system optimization, covering new techniques such as evolutionary methods, swarm, and ant colony optimizations Discusses several applications that deal with methods of computational intelligence Other volumes in the set: Fundamentals of Industrial Electronics Power Electronics and Motor Drives Control and Mechatronics Industrial Communication Systems

Lectures on Soft Computing and Fuzzy Logic Antonio Di Nola 2013-06-05 The present volume collects selected papers arising from lectures delivered by the authors at the School on Fuzzy Logic and Soft Computing held during the years 1996/97/98/99 and sponsored by the Salerno University. The authors contributing to this volume agreed with editors to write down, to enlarge and, in many cases, to rethink their original lectures, in order to offer to readership, a more compact presentation of the proposed topics. The aim of the volume is to offer a picture, as a job in progress, of the effort that is coming in founding and developing soft computing's techniques. The volume contains papers aimed to report on recent results containing genuinely logical aspects of fuzzy logic. The topics treated in this area cover algebraic aspects of Lukasiewicz Logic, Fuzzy Logic as the logic of continuous t-norms, Intuitionistic Fuzzy Logic. Aspects of fuzzy logic based on similar ity relation are presented in connection with the problem of flexible querying in deductive database.

Departing from fuzzy logic, some papers present re sults in Probability Logic treating computational aspects, results based on indishernability relation and a non commutative version of generalized effect algebras. Several strict applications of soft computing are presented in the book. Indeed we find applications ranging among pattern recognition, image and signal processing, evolutionary agents, fuzzy cellular networks, classi fication in fuzzy environments. The volume is then intended to serve as a reference work for foundational logico-algebraic aspect of Soft Computing and for concrete applications of soft computing technologies.

Recent Advances in Intelligent Control Systems Wen Yu 2009-05-27 "Recent Advances in Intelligent Control Systems" gathers contributions from workers around the world and presents them in four categories according to the style of control employed: fuzzy control; neural control; fuzzy neural control; and intelligent control. The contributions illustrate the interdisciplinary antecedents of intelligent control and contrast its results with those of more traditional control methods. A variety of design examples, drawn primarily from robotics and mechatronics but also representing process and production engineering, large civil structures, network flows, and others, provide instances of the application of computational intelligence for control. Presenting state-of-the-art research, this collection will be of benefit to researchers in automatic control, automation, computer science (especially artificial intelligence) and mechatronics while graduate students and practicing control engineers working with intelligent systems will find it a good source of study material.

Introduction To Type-2 Fuzzy Logic Control Jerry Mendel 2014-06-16 An introductory book that provides theoretical, practical,and application coverage of the emerging field of type-2 fuzzylogic control Until recently, little was known about type-2 fuzzy controllersdue to the lack of basic calculation methods available for type-2fuzzy sets and logic—and many different aspects of type-2fuzzy control still needed to be investigated in order to advancethis new and powerful technology. This self-contained referencecovers everything readers need to know about the growing field. Written with an educational focus in mind, Introduction toType-2 Fuzzy

Logic Control: Theory and Applications uses acoherent structure and uniform mathematical notations to linkchapters that are closely related, reflecting the book'scentral themes: analysis and design of type-2 fuzzy controlsystems. The book includes worked examples, experiment andsimulation results, and comprehensive reference materials. The bookalso offers downloadable computer programs from an associatedwebsite. Presented by world-class leaders in type-2 fuzzy logic control,Introduction to Type-2 Fuzzy Logic Control: Is useful for any technical person interested in learningtype-2 fuzzy control theory and its applications Offers experiment and simulation results via downloadablecomputer programs Features type-2 fuzzy logic background chapters to make thebook self-contained Provides an extensive literature survey on both fuzzy logic andrelated type-2 fuzzy control Introduction to Type-2 Fuzzy Logic Control is aneasy-to-read reference book suitable for engineers, researchers,and graduate students who want to gain deep insight into type-2fuzzy logic control.

Design of Intelligent Systems Based on Fuzzy Logic, Neural Networks and Nature-Inspired Optimization Patricia Melin 2015-06-12 This book presents recent advances on the design of intelligent systems based on fuzzy logic, neural networks and nature-inspired optimization and their application in areas such as, intelligent control and robotics, pattern recognition, time series prediction and optimization of complex problems. The book is organized in eight main parts, which contain a group of papers around a similar subject. The first part consists of papers with the main theme of theoretical aspects of fuzzy logic, which basically consists of papers that propose new concepts and algorithms based on fuzzy systems. The second part contains papers with the main theme of neural networks theory, which are basically papers dealing with new concepts and algorithms in neural networks. The third part contains papers describing applications of neural networks in diverse areas, such as time series prediction and pattern recognition. The fourth part contains papers describing new nature-inspired optimization algorithms. The fifth part presents diverse applications of nature-inspired optimization algorithms. The sixth part contains papers describing new

optimization algorithms. The seventh part contains papers describing applications of fuzzy logic in diverse areas, such as time series prediction and pattern recognition. Finally, the eighth part contains papers that present enhancements to meta-heuristics based on fuzzy logic techniques.

Methods and Applications of Intelligent Control S.G. Tzafestas 2012-12-06 This book is concerned with Intelligent Control methods and applications. The field of intelligent control has been expanded very much during the recent years and a solid body of theoretical and practical results are now available. These results have been obtained through the synergetic fusion of concepts and techniques from a variety of fields such as automatic control, systems science, computer science, neurophysiology and operational research. Intelligent control systems have to perform anthropomorphic tasks fully autonomously or interactively with the human under known or unknown and uncertain environmental conditions. Therefore the basic components of any intelligent control system include cognition, perception, learning, sensing, planning, numeric and symbolic processing, fault detection/repair, reaction, and control action. These components must be linked in a systematic, synergetic and efficient way. Predecessors of intelligent control are adaptive control, self-organizing control, and learning control which are well documented in the literature. Typical application examples of intelligent controls are intelligent robotic systems, intelligent manufacturing systems, intelligent medical systems, and intelligent space teleoperators. Intelligent controllers must employ both quantitative and qualitative information and must be able to cope with severe temporal and spatial variations, in addition to the fundamental task of achieving the desired transient and steady-state performance. Of course the level of intelligence required in each particular application is a matter of discussion between the designers and users. The current literature on intelligent control is increasing, but the information is still available in a sparse and disorganized way.
Intelligent Control in Drying Alex Martynenko 2018-09-03 Despite the available general literature in intelligent control, there is a definite lack of knowledge and know-how in practical applications of intelligent control in drying. This book fills that gap. Intelligent Control in Drying serves as an innovative and practical guide for researchers and professionals in the field of drying technologies, providing an overview of control principles and systems used in drying operations, from classical to model-based to adaptive and optimal control. At the same time, it lays out approaches to synthesis of control systems, based on the objectives and control strategies, reflecting complexity of drying process and material under drying. This essential reference covers both fundamental and practical aspects of intelligent control, sensor fusion and dynamic optimization with respect to drying.

Intelligent Control of Robotic Systems D. Katic 2013-03-14 As robotic systems make their way into standard practice, they have opened the door to a wide spectrum of complex applications. Such applications usually demand that the robots be highly intelligent. Future robots are likely to have greater sensory capabilities, more intelligence, higher levels of manual dexter ity, and adequate mobility, compared to humans. In order to ensure high-quality control and performance in robotics, new intelligent control techniques must be developed, which are capable of coping with task complexity, multi-objective decision making, large volumes of perception data and substantial amounts of heuristic information. Hence, the pursuit of intelligent autonomous robotic systems has been a topic of much fascinating research in recent years. On the other hand, as emerging technologies, Soft Computing paradigms consisting of complementary elements of Fuzzy Logic, Neural Computing and Evolutionary Computation are viewed as the most promising methods towards intelligent robotic systems. Due to their strong learning and cognitive ability and good tolerance of uncertainty and imprecision, Soft Computing techniques have found wide application in the area of intelligent control of robotic systems.

Intelligent Control C J Harris 1993-03-31 With increasing demands for high precision autonomous control over wide operating envelopes, conventional control engineering approaches are unable to adequately deal with system complexity, nonlinearities, spatial and temporal parameter variations, and with uncertainty. Intelligent Control or self-

organising/learning control is a new emerging discipline that is designed to deal with problems. Rather than being model based, it is experiential based. Intelligent Control is the amalgam of the disciplines of Artificial Intelligence, Systems Theory and Operations Research. It uses most recent experiences or evidence to improve its performance through a variety of learning schemas, that for practical implementation must demonstrate rapid learning convergence, be temporally stable, be robust to parameter changes and internal and external disturbances. It is shown in this book that a wide class of fuzzy logic and neural net based learning algorithms satisfy these conditions. It is demonstrated that this class of intelligent controllers is based upon a fixed nonlinear mapping of the input (sensor) vector, followed by an output layer linear mapping with coefficients that are updated by various first order learning laws. Under these conditions self-organising fuzzy logic controllers and neural net controllers have common learning attributes. A theme example of the navigation and control of an autonomous guided vehicle is included throughout, together with a series of bench examples to demonstrate this new theory and its applicability. Contents: An Introduction to Intelligent ControlIntroductory Fuzzy LogicFuzzy Logic Controller Structure and DesignThe Static Fuzzy Logic ControllerSelf-Organising Fuzzy Logic ControlIndirect Self-Organising Fuzzy Logic ControllersCase Studies of Direct Adaptive Fuzzy ControlNeural Network Approximation Capability for Control and ModellingThe B-Spline Neural Network and Fuzzy LogicThe Appendix: Mathematical Prerequisities Readership: Computer scientists, engineers and nonlinear scientists. keywords:

Intelligent Control: Principles, Techniques and Applications