

Intelligent Control Systems Using Computational Intelligence Techniques

Edited by A. Ruano

Intelligent Control Systems Using Computational Intelligence Techniques Iee Control Series Iee Control Series

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Intelligent Control Systems Using Computational Intelligence Techniques Iee Control Series Iee Control Series:

Intelligent Control Systems Using Computational Intelligence Techniques A.E. Ruano, 2005-07-18 Intelligent Control techniques are becoming important tools in both academia and industry Methodologies developed in the field of soft computing such as neural networks fuzzy systems and evolutionary computation can lead to accommodation of more complex processes improved performance and considerable time savings and cost reductions Intelligent Control Systems using Computational Intelligence Techniques details the application of these tools to the field of control systems Each chapter gives an overview of current approaches in the topic covered with a set of the most important references in the field and then details the author's approach examining both the theory and practical applications *Computational Intelligence in Automotive Applications* Danil Prokhorov, 2008-05-28 What is computational intelligence CI Traditionally CI is understood as a collection of methods from the fields of neural networks NN fuzzy logic and evolutionary computation Various definitions and opinions exist but what belongs to CI is still being debated see e.g. 1 3 More recently there has been a proposal to define the CI not in terms of the tools but in terms of challenging problems to be solved 4 With this edited volume I have made an attempt to give a representative sample of contemporary CI activities in automotive applications to illustrate the state of the art While CI research and achievements in some specialized fields described see e.g. 5 6 this is the first volume of its kind dedicated to automotive technology As if reflecting the general lack of consensus on what constitutes the field of CI this volume 1 illustrates automotive applications of not only neural and fuzzy computations which are considered to be the standard CI topics but also others such as decision trees graphical models Support Vector Machines SVM multi agent systems etc This book is neither an introductory text nor a comprehensive overview of all CI research in this area Hopefully as a broad and representative sample of CI activities in automotive applications it will be worth reading for both professionals and students When the details appear insufficient the reader is encouraged to consult other relevant sources provided by the chapter authors

Modelling and Control of Dynamic Systems Using Gaussian Process Models Juš Kocijan, 2015-11-21 This monograph opens up new horizons for engineers and researchers in academia and in industry dealing with or interested in new developments in the field of system identification and control It emphasizes guidelines for working solutions and practical advice for their implementation rather than the theoretical background of Gaussian process GP models The book demonstrates the potential of this recent development in probabilistic machine learning methods and gives the reader an intuitive understanding of the topic The current state of the art is treated along with possible future directions for research Systems control design relies on mathematical models and these may be developed from measurement data This process of system identification when based on GP models can play an integral part of control design in data based control and its description as such is an essential aspect of the text The background of GP regression is introduced first with system identification and incorporation of prior knowledge then leading into full blown control The book is illustrated by extensive

use of examples line drawings and graphical presentation of computer simulation results and plant measurements The research results presented are applied in real life case studies drawn from successful applications including a gas liquid separator control urban traffic signal modelling and reconstruction and prediction of atmospheric ozone concentration A MATLAB toolbox for identification and simulation of dynamic GP models is provided for download Computational Intelligence Nazmul Siddique,Hojjat Adeli,2013-05-06 Computational Intelligence Synergies of Fuzzy Logic Neural Networks and Evolutionary Computing presents an introduction to some of the cutting edge technological paradigms under the umbrella of computational intelligence Computational intelligence schemes are investigated with the development of a suitable framework for fuzzy logic neural networks and evolutionary computing neuro fuzzy systems evolutionary fuzzy systems and evolutionary neural systems Applications to linear and non linear systems are discussed with examples Key features Covers all the aspects of fuzzy neural and evolutionary approaches with worked out examples MATLAB exercises and applications in each chapter Presents the synergies of technologies of computational intelligence such as evolutionary fuzzy neural fuzzy and evolutionary neural systems Considers real world problems in the domain of systems modelling control and optimization Contains a foreword written by Lotfi Zadeh Computational Intelligence Synergies of Fuzzy Logic Neural Networks and Evolutionary Computing is an ideal text for final year undergraduate postgraduate and research students in electrical control computer industrial and manufacturing engineering Time-Frequency Signal Analysis and Processing Boualem Boashash,2015-12-11 Time Frequency Signal Analysis and Processing TFSAP is a collection of theory techniques and algorithms used for the analysis and processing of non stationary signals as found in a wide range of applications including telecommunications radar and biomedical engineering This book gives the university researcher and R a Getting Started chapter enabling readers to start using the algorithms on simulated and real examples with the TFSAP toolbox compare the results with the ones presented in the book and then insert the algorithms in their own applications and adapt them as needed Two new chapters and twenty three new sections including updated references New topics including efficient algorithms for optimal TFDs with source code the enhanced spectrogram time frequency modelling more mathematical foundations the relationships between QTFDs and Wavelet Transforms new advanced applications such as cognitive radio watermarking noise reduction in the time frequency domain algorithms for Time Frequency Image Processing and Time Frequency applications in neuroscience new chapter A comprehensive tutorial introduction to Time Frequency Signal Analysis and Processing TFSAP accessible to anyone who has taken a first course in signals Key advances in theory methodology and algorithms are concisely presented by some of the leading authorities on the respective topics Applications written by leading researchers showing how to use TFSAP methods **Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK®** S. Sumathi,L. Ashok Kumar,Surekha. P,2018-09-03 Considered one of the most innovative research directions computational intelligence CI embraces techniques that use global search

optimization machine learning approximate reasoning and connectionist systems to develop efficient robust and easy to use solutions amidst multiple decision variables complex constraints and tumultuous environments CI techniques involve a combination of learning adaptation and evolution used for intelligent applications Computational Intelligence Paradigms for Optimization Problems Using MATLAB Simulink explores the performance of CI in terms of knowledge representation adaptability optimality and processing speed for different real world optimization problems Focusing on the practical implementation of CI techniques this book Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch harmonic reduction load frequency control and automatic voltage regulation job shop scheduling multidepot vehicle routing and digital image watermarking Explains the impact of CI on power systems control systems industrial automation and image processing through the above mentioned applications Shows how to apply CI algorithms to constraint based optimization problems using MATLAB m files and Simulink models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB Simulink provides a valuable reference for industry professionals and advanced undergraduate postgraduate and research students

Energy, Information, Feedback, Adaptation, and Self-organization Spyros G Tzafestas, 2018-01-03 This unique book offers a comprehensive and integrated introduction to the five fundamental elements of life and society energy information feedback adaptation and self organization It is divided into two parts Part I is concerned with energy definition history energy types energy sources environmental impact thermodynamics laws entropy definitions energy branches of thermodynamics entropy interpretations arrow of time information communication and transmission modulation demodulation coding decoding information theory information technology information science information systems feedback control history classical methodologies modern methodologies adaptation definition mechanisms measurement complex adaptive systems complexity emergence and self organization definitions opinions self organized criticality cybernetics self organization in complex adaptive systems examples in nature In turn Part II studies the roles impacts and applications of the five above mentioned elements in life and society namely energy biochemical energy pathways energy flows through food chains evolution of energy resources energy and economy information information in biology biocomputation information technology in office automation power generation distribution manufacturing business transportation feedback temperature water sugar and hydrogen ion regulation autocatalysis biological modeling control of hard technological and soft managerial systems adaptation and self organization ecosystems climate change stock market knowledge management man made self organized controllers traffic lights control

Multisensor Fusion Anthony K. Hyder, E. Shabbazian, E. Waltz, 2012-12-06 For some time all branches of the military have used a wide range of sensors to provide data for many purposes including surveillance reconnoitring target detection and battle damage assessment Many nations have also attempted to utilise these sensors for civilian applications such as crop monitoring agricultural disease tracking environmental diagnostics cartography

ocean temperature profiling urban planning and the characterisation of the Ozone Hole above Antarctica The recent convergence of several important technologies has made possible new advanced high performance sensor based applications relying on the near simultaneous fusion of data from an ensemble of different types of sensors The book examines the underlying principles of sensor operation and data fusion the techniques and technologies that enable the process including the operation of fusion engines Fundamental theory and the enabling technologies of data fusion are presented in a systematic and accessible manner Applications are discussed in the areas of medicine meteorology BDA and targeting transportation cartography the environment agriculture and manufacturing and process control

Artificial Intelligence in Mechanical and Industrial Engineering Kaushik Kumar, Divya Zindani, J. Paulo Davim, 2021-06-20 Artificial Intelligence in Mechanical and Industrial Engineering offers a unified platform for the dissemination of basic and applied knowledge on the integration of artificial intelligence within the realm of mechanical and industrial engineering The book covers the tools and information needed to build successful careers and a source of knowledge for those working with AI within these domains The book offers a systematic approach to explicate fundamentals as well as recent advances It incorporates various case studies for major topics as well as numerous examples It will also include real time intelligent automation and associated supporting methodologies and techniques and cover decision support systems as well as applications of Chaos Theory and Fractals The book will give scientists researchers instructors students and practitioners the tools and information needed to build successful careers and to be an impetus to advancements in next generation mechanical and industrial engineering domains

Efficiency and Scalability Methods for Computational Intellect Igelnik, Boris, Zurada, Jacek M., 2013-04-30 Computational modeling and simulation has developed and expanded into a diverse range of fields such as digital signal processing image processing robotics systems biology and many more enhancing the need for a diversifying problem solving applications in this area Efficiency and Scalability Methods for Computational Intellect presents various theories and methods for approaching the problem of modeling and simulating intellect in order to target computation efficiency and scalability of proposed methods Researchers instructors and graduate students will benefit from this current research and will in turn be able to apply the knowledge in an effective manner to gain an understanding of how to improve this field

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

Hydrogen-Air PEM Fuel Cell Shiwen Tong,Dianwei Qian,Chunlei Huo,2018-09-24 The book presents the modeling and control of hydrogen air PEM fuel cells including simultaneous estimation of the parameters and states fuzzy cluster modeling SPM based predictive control and advanced fuzzy control MATLAB Simulink based modeling and control programs are discussed in detail With simulations and experiments it is an essential reference for both scientists and industrial engineers

Interactive Collaborative Robotics Andrey Ronzhin,Roman Meshcheryakov,Zhen Xiantong,2022-12-17 This book constitutes the proceedings of the 7th International Conference on Interactive Collaborative Robotics ICR 2022 held in Fuzhou China in December 2022 The 25 papers presented were carefully reviewed and selected from 45 submissions Challenges of human robot interaction robot control and behavior in social robotics and collaborative robotics as well as applied robotic and cyber physical systems are mainly discussed in the papers

Artificial Intelligence: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources,2016-12-12 Ongoing advancements in modern technology have led to significant developments in artificial intelligence With the numerous applications available it becomes imperative to conduct research and make further progress in this field Artificial Intelligence Concepts Methodologies Tools and Applications provides a comprehensive overview of the latest breakthroughs and recent progress in artificial intelligence Highlighting relevant technologies uses and techniques across various industries and settings this publication is a pivotal reference source for researchers professionals academics upper level students and practitioners interested in emerging perspectives in the field of artificial intelligence

Emerging Technology in Modelling and Graphics Jyotsna Kumar Mandal,Debika Bhattacharya,2019-07-16 The book covers cutting edge and advanced research in modelling and graphics Gathering high quality papers presented at the First International Conference on Emerging Technology in Modelling and Graphics held from 6 to 8 September 2018 in Kolkata India it addresses topics including image processing and analysis image segmentation digital geometry for computer imaging image and security biometrics video processing medical imaging and virtual and augmented reality

Handbook of Research on Artificial Intelligence Techniques and Algorithms Vasant, Pandian,2014-11-30 For decades optimization methods such as Fuzzy Logic Artificial Neural Networks Firefly Simulated annealing and Tabu search have been capable of handling and tackling a wide range of real world application problems in

society and nature Analysts have turned to these problem solving techniques in the event during natural disasters and chaotic systems research The Handbook of Research on Artificial Intelligence Techniques and Algorithms highlights the cutting edge developments in this promising research area This premier reference work applies Meta heuristics Optimization MO Techniques to real world problems in a variety of fields including business logistics computer science engineering and government This work is particularly relevant to researchers scientists decision makers managers and practitioners

Computational Intelligence Techniques for 5G Enabled IoT Networks Mohit Kumar, Sukhpal Singh Gill, Vijay Kumar, Prabal Verma, 2025-07-26 This book explores emerging interdisciplinary themes and applications reflecting advancements in Computational Intelligence CI for IoT and 5G networks It is divided into four sections Section 1 introduces Computational Intelligence and Sustainability Solutions for Next Gen IoT Networks Section 2 covers Optimization and Resilience Strategies for 5G Enabled IoT Networks Section 3 delves Intelligent Resource Allocation and Service Optimization in 5G IoT Networks Section 4 presents Case studies on Applied Computational Intelligence and 5G IoT Innovations for Industry 4 0 This comprehensive work is essential for researchers and professionals interested in leveraging CI IoT and 5G technologies across diverse applications

Advances in Metaheuristics Timothy Ganesan, Pandian Vasant, Irraivan Elamvazuthi, 2016-11-28 Advances in Metaheuristics Applications in Engineering Systems provides details on current approaches utilized in engineering optimization It gives a comprehensive background on metaheuristic applications focusing on main engineering sectors such as energy process and materials It discusses topics such as algorithmic enhancements and performance measurement approaches and provides insights into the implementation of metaheuristic strategies to multi objective optimization problems With this book readers can learn to solve real world engineering optimization problems effectively using the appropriate techniques from emerging fields including evolutionary and swarm intelligence mathematical programming and multi objective optimization The ten chapters of this book are divided into three parts The first part discusses three industrial applications in the energy sector The second focusses on process optimization and considers three engineering applications optimization of a three phase separator process plant and a pre treatment process The third and final part of this book covers industrial applications in material engineering with a particular focus on sand mould systems It also includes discussions on the potential improvement of algorithmic characteristics via strategic algorithmic enhancements This book helps fill the existing gap in literature on the implementation of metaheuristics in engineering applications and real world engineering systems It will be an important resource for engineers and decision makers selecting and implementing metaheuristics to solve specific engineering problems

Machine Learning, Advances in Computing, Renewable Energy and Communication Anuradha Tomar, Hasmat Malik, Pramod Kumar, Atif Iqbal, 2021-08-19 This book gathers selected papers presented at International Conference on Machine Learning Advances in Computing Renewable Energy and Communication MARC 2020 held in Krishna Engineering College Ghaziabad India during

December 17 18 2020 This book discusses key concepts challenges and potential solutions in connection with established and emerging topics in advanced computing renewable energy and network communications *Handbook of Fuzzy Computation*
E Ruspini,P Bonissone,W Pedrycz,2020-03-05 Initially conceived as a methodology for the representation and manipulation of imprecise and vague information fuzzy computation has found wide use in problems that fall well beyond its originally intended scope of application Many scientists and engineers now use the paradigms of fuzzy computation to tackle problems that are either intractable

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