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KRAMER LOGAN

Predictive Control in Process Engineering Springer Science & Business Media

This up-to-date book details the basic concepts of many recent developments of nonlinear identification and nonlinear control, and their application to hydraulic servo-systems. It is very application-oriented and provides the reader with detailed working procedures and hints for implementation routines and software tools.

Non-linear Predictive Control Springer Science & Business Media

Artificial Neural Networks for Engineering Applications presents current trends for the solution of complex engineering problems that cannot be solved through conventional methods. The proposed methodologies can be applied to modeling, pattern recognition, classification, forecasting, estimation, and more. Readers will find different methodologies to solve various problems, including complex nonlinear systems, cellular computational networks, waste water treatment, attack detection on cyber-physical systems, control of UAVs, biomechanical and biomedical systems, time series forecasting, biofuels, and more. Besides the real-time implementations, the book contains all the theory required to use the proposed methodologies for different applications. Presents the current trends for the solution of complex engineering problems that cannot be solved through conventional methods Includes real-life scenarios where a wide range of artificial neural network architectures can be used to solve the problems encountered in engineering Contains all the theory required to use the proposed methodologies for different applications

Neural Nets Academic Press

Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms is an organized edited collection of contributed chapters covering basic principles, methodologies, and applications of fuzzy systems, neural networks and genetic algorithms. All chapters are original contributions by leading researchers written exclusively for this volume. This book reviews important concepts and models, and focuses on specific methodologies common to fuzzy systems, neural networks and evolutionary computation. The emphasis is on development of cooperative models of hybrid systems. Included are applications related to intelligent data analysis, process analysis, intelligent adaptive information systems, systems identification, nonlinear systems, power and water system

design, and many others. Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms provides researchers and engineers with up-to-date coverage of new results, methodologies and applications for building intelligent systems capable of solving large-scale problems.

Fault-Diagnosis Systems KIT Scientific Publishing

This book treats various methods for stability analysis and controller design of local model networks (LMNs). LMNs have proved to be a powerful tool in nonlinear dynamic system identification. Their system architecture is more suitable for controller design compared to alternative approximation methods. The main advantage is that linear controller design methods can be, at least locally, applied and combined with nonlinear optimization to calibrate stable state feedback as well as PID controller. The calibration of stable state-feedback controllers is based on the closed loop stability analysis methods. Here, global LMIs (Linear Matrix Inequalities) can be derived and numerically solved. For LMN based nonlinear PID controllers deriving global LMIs is not possible. Thus, two approaches are treated in this book. The first approach works iteratively to get LMIs in each iteration step. The second approach uses a genetic algorithm to determine the PID controller parameters where for each individual the stability is checked. It allows simultaneous enhancement of (competing) optimization criteria.

Adaptive Nonlinear System Identification CRC Press

Adaptive Learning Methods for Nonlinear System Modeling presents some of the recent advances on adaptive algorithms and machine learning methods designed for nonlinear system modeling and identification. Real-life problems always entail a certain degree of nonlinearity, which makes linear models a non-optimal choice. This book mainly focuses on those methodologies for nonlinear modeling that involve any adaptive learning approaches to process data coming from an unknown nonlinear system. By learning from available data, such methods aim at estimating the nonlinearity introduced by the unknown system. In particular, the methods presented in this book are based on online learning approaches, which process the data example-by-example and allow to model even complex nonlinearities, e.g., showing time-varying and dynamic behaviors. Possible fields of applications of such algorithms includes distributed sensor networks, wireless communications, channel identification, predictive maintenance, wind prediction, network security, vehicular networks, active noise control, information forensics and security, tracking control in mobile robots,

power systems, and nonlinear modeling in big data, among many others. This book serves as a crucial resource for researchers, PhD and post-graduate students working in the areas of machine learning, signal processing, adaptive filtering, nonlinear control, system identification, cooperative systems, computational intelligence. This book may be also of interest to the industry market and practitioners working with a wide variety of nonlinear systems. Presents the key trends and future perspectives in the field of nonlinear signal processing and adaptive learning. Introduces novel solutions and improvements over the state-of-the-art methods in the very exciting area of online and adaptive nonlinear identification. Helps readers understand important methods that are effective in nonlinear system modelling, suggesting the right methodology to address particular issues.

Stability Analysis and Controller Design of Local Model Networks Springer Science & Business Media

The advantage of model predictive control is that it can take systematic account of constraints, thereby allowing processes to operate at the limits of achievable performance. Engineers in academia, industry, and government from the US and Europe explain how the linear version can be adapted and applied to the nonlinear conditions that characterize the dynamics of most real manufacturing plants. They survey theoretical and practical trends, describe some specific theories and demonstrate their practical application, derive strategies that provide appropriate assurance of closed-loop stability, and discuss practical implementation. Annotation copyrighted by Book News, Inc., Portland, OR

Cluster Analysis for Data Mining and System Identification Thomas Reed Publications

The ubiquitous digital transformation also influences power system operation. Emerging real-time applications in information (IT) and operational technology (OT) provide new opportunities to address the increasingly demanding power system operation imposed by the progressing energy transition. This IT/OT convergence is epitomised by the novel Digital Twin (DT) concept. By integrating sensor data into analytical models and aligning the model states with the observed system, a power system DT can be created. As a result, a validated high-fidelity model is derived, which can be applied within the next generation of energy management systems (EMS) to support power system operation. By providing a consistent and maintainable data model, the modular DT-centric EMS proposed in this work addresses several key requirements of modern EMS architectures. It increases the situation awareness in the control room, enables the implementation of model maintenance routines, and facilitates automation approaches, while raising the confidence into operational decisions deduced from the validated model. This gain in trust contributes to the digital transformation and enables a higher degree of power system automation. By considering operational planning and power system operation processes, a direct link to practice is ensured. The feasibility of the concept is examined by numerical case studies.

Safe, Autonomous and Intelligent Vehicles Springer Science & Business Media

Safety in industrial process and production plants is a concern of rising importance but because the control devices which are now exploited to improve the performance of industrial processes include both sophisticated digital system design techniques and complex hardware, there is a higher probability of failure. Control systems must include automatic supervision of closed-loop operation to detect and isolate malfunctions quickly. A promising method for solving this problem is "analytical redundancy", in which residual signals are obtained and an accurate model of the system mimics

real process behaviour. If a fault occurs, the residual signal is used to diagnose and isolate the malfunction. This book focuses on model identification oriented to the analytical approach of fault diagnosis and identification covering: choice of model structure; parameter identification; residual generation; and fault diagnosis and isolation. Sample case studies are used to demonstrate the application of these techniques.

Artificial Neural Networks for Engineering Applications Walter de Gruyter GmbH & Co KG

Dieser Tagungsband enthält die Beiträge des 20. Workshops "Computational Intelligence" des Fachausschusses 5.14 der VDI/VDE-Gesellschaft für Mess- und Automatisierungstechnik (GMA) der vom 1.-3. Dezember 2010 im Haus Bommerholz (Dortmund) stattfand. Die Schwerpunkte waren Methoden, Anwendungen und Tools für- Fuzzy-Systeme, - Künstliche Neuronale Netze, - Evolutionäre Algorithmen und- Data-Mining-Verfahren sowie der Methodenvergleich anhand von industriellen und Benchmark-Problemen.

Recent Advances in Soft Computing Elsevier

Nonlinear System Identification: NARMAX Methods in the Time, Frequency, and Spatio-Temporal Domains describes a comprehensive framework for the identification and analysis of nonlinear dynamic systems in the time, frequency, and spatio-temporal domains. This book is written with an emphasis on making the algorithms accessible so that they can be applied and used in practice. Includes coverage of: The NARMAX (nonlinear autoregressive moving average with exogenous inputs) model The orthogonal least squares algorithm that allows models to be built term by term where the error reduction ratio reveals the percentage contribution of each model term Statistical and qualitative model validation methods that can be applied to any model class Generalised frequency response functions which provide significant insight into nonlinear behaviours A completely new class of filters that can move, split, spread, and focus energy The response spectrum map and the study of sub harmonic and severely nonlinear systems Algorithms that can track rapid time variation in both linear and nonlinear systems The important class of spatio-temporal systems that evolve over both space and time Many case study examples from modelling space weather, through identification of a model of the visual processing system of fruit flies, to tracking causality in EEG data are all included to demonstrate how easily the methods can be applied in practice and to show the insight that the algorithms reveal even for complex systems NARMAX algorithms provide a fundamentally different approach to nonlinear system identification and signal processing for nonlinear systems. NARMAX methods provide models that are transparent, which can easily be analysed, and which can be used to solve real problems. This book is intended for graduates, postgraduates and researchers in the sciences and engineering, and also for users from other fields who have collected data and who wish to identify models to help to understand the dynamics of their systems.

Identification of Dynamic Systems Springer

The book constitutes the proceedings of the 24th International Conference on Artificial Neural Networks, ICANN 2014, held in Hamburg, Germany, in September 2014. The 107 papers included in the proceedings were carefully reviewed and selected from 173 submissions. The focus of the papers is on following topics: recurrent networks; competitive learning and self-organisation; clustering and classification; trees and graphs; human-machine interaction; deep networks; theory;

reinforcement learning and action; vision; supervised learning; dynamical models and time series; neuroscience; and applications.

Nonlinear Model Predictive Control of Combustion Engines Springer Nature

With increasing demands for efficiency and product quality plus progress in the integration of automatic control systems in high-cost mechatronic and safety-critical processes, the field of supervision (or monitoring), fault detection and fault diagnosis plays an important role. The book gives an introduction into advanced methods of fault detection and diagnosis (FDD). After definitions of important terms, it considers the reliability, availability, safety and systems integrity of technical processes. Then fault-detection methods for single signals without models such as limit and trend checking and with harmonic and stochastic models, such as Fourier analysis, correlation and wavelets are treated. This is followed by fault detection with process models using the relationships between signals such as parameter estimation, parity equations, observers and principal component analysis. The treated fault-diagnosis methods include classification methods from Bayes classification to neural networks with decision trees and inference methods from approximate reasoning with fuzzy logic to hybrid fuzzy-neuro systems. Several practical examples for fault detection and diagnosis of DC motor drives, a centrifugal pump, automotive suspension and tire demonstrate applications.

New Technologies, Development and Application VI Springer Nature

This book provides engineers and scientists in academia and industry with a thorough understanding of the underlying principles of nonlinear system identification. It equips them to apply the models and methods discussed to real problems with confidence, while also making them aware of potential difficulties that may arise in practice. Moreover, the book is self-contained, requiring only a basic grasp of matrix algebra, signals and systems, and statistics. Accordingly, it can also serve as an introduction to linear system identification, and provides a practical overview of the major optimization methods used in engineering. The focus is on gaining an intuitive understanding of the subject and the practical application of the techniques discussed. The book is not written in a theorem/proof style; instead, the mathematics is kept to a minimum, and the ideas covered are illustrated with numerous figures, examples, and real-world applications. In the past, nonlinear system identification was a field characterized by a variety of ad-hoc approaches, each applicable only to a very limited class of systems. With the advent of neural networks, fuzzy models, Gaussian process models, and modern structure optimization techniques, a much broader class of systems can now be handled. Although one major aspect of nonlinear systems is that virtually every one is unique, tools have since been developed that allow each approach to be applied to a wide variety of systems.

Strategies for Feedback Linearisation John Wiley & Sons

From the content: Introduction Mathematical modelling Measurement Scientific explanation Context of discovery Context of justification Uncertainty of scientific knowledge Morality and moral philosophy System of values associated with science General principles of moral decision-making Research ethics Methodological and ethical issues related to experimentation Methodological and ethical issues to research information Methodological and ethical issues related to legal protection of intellectual property

Nonlinear System Identification with Local Linear Neuro-fuzzy Models John Wiley & Sons

This book covers the start-of-the-art research and development for the emerging area of autonomous and intelligent systems. In particular, the authors emphasize design and validation methodologies to address the grand challenges related to safety. This book offers a holistic view of a broad range of technical aspects (including perception, localization and navigation, motion control, etc.) and application domains (including automobile, aerospace, etc.), presents major challenges and discusses possible solutions.

Nonlinear System Identification Springer Science & Business Media

Capitalizing on the rapid growth and reduced costs of laser systems, laser cladding is gaining momentum, and in some instances replacing conventional techniques of depositing thin films because it can accommodate a great variety of materials, achieve uniform thickness and precise widths of layers, and provide improved resistance to wear and corrosion in the final product. Laser cladding technology also offers a revolutionary layered manufacturing and prototyping technique that can fabricate complex components without intermediate steps. Laser Cladding reviews the parameters, techniques and equipment, process modeling and control, and the physical metallurgy of alloying and solidification during laser cladding. The authors clarify the interconnections laser cladding has with CAD/CAM design; automation and robotics; sensors, feedback, and control; physics, material science, heat transfer, fluid dynamics, and powder metallurgy to promote further development and improved process quality of this growing technology. As the first book entirely dedicated to the topic, it also offers a history of its development and a guide to applications and market opportunities. While a considerable part of Laser Cladding is dedicated to industrial applications, this volume brings together valuable information illustrated with real case studies based on the authors' vast experience, and research and analysis in the field to provide a timely source for both academia and industry.

System Identification 2003 kassel university press GmbH

Piezoelectric Aeroelastic Energy Harvesting explains the design and implementation of piezoelectric energy harvesting devices based on fluid-structure interaction. There is currently an increase in demand for low power electronic instruments in a range of settings, and recent advances have driven their energy consumption downwards. As a result, the possibility to extract energy from an operational environment is of growing significance to industry and academic research globally. This book solves problems related to the integration of smart structures with the aeroelastic system, addresses the importance of the aerodynamic model on accurate prediction of the performance of the energy harvester, describes the overall effect of the piezoelectric patch on the dynamics of the system, and explains different mechanisms for harvesting energy via fluid-structure interaction. This wealth of innovative technical information is supported by introductory chapters on piezoelectric materials, energy harvesting and circuits, and fluid structure interaction, opening this interdisciplinary topic up for readers with a range of backgrounds. Provides new designs of piezoelectric energy harvesters for fluid-structure interaction Explains how to correctly model aerodynamics for effective aeroelastic energy harvesting Numerical examples allow the reader to practice the design, modeling and implementation of piezoelectric energy harvesting devices

Intelligent Hybrid Systems Springer Science & Business Media

Some novel approaches to estimate Nonlinear Output Error (NOE) models using TS fuzzy models for a class of nonlinear dynamic systems having variability in their outputs is presented in this dissertation. Instead of using unrealistic assumptions about uncertainty, the most common of which is normality, the proposed methodology tends to capture effects caused by the real uncertainty observed in the data. The methodology requires that the identification method must be repeated offline a number of times under similar conditions. This leads to multiple inputoutput time series from the underlying system. These time series are preprocessed using the techniques of statistics and probability theory to generate the envelopes of response at each time instant. By incorporating interval data in fuzzy modelling and using the theory of symbolic interval-valued data, a TS fuzzy model with interval antecedent and consequent parameters is obtained. The proposed identification algorithm provides for a model for predicting the center-valued response as well as envelopes as the measure of uncertainty in system output.

Model-based Fault Diagnosis in Dynamic Systems Using Identification Techniques Springer

The increasing automation of driving functions and the electrification of powertrains present new challenges for the chassis with regard to complexity, redundancy, data security, and installation space. At the same time, the mobility of the future will also require entirely new vehicle concepts, particularly in urban areas. The intelligent chassis must be connected, electrified, and automated in

order to be best prepared for this future. Contents Driving Simulators.- Innovative Chassis Systems.- Automated Driving and Racing.- New Methods and Systems.- Suspension and Ride Comfort.- All-Wheel Steering.- Future Brake Systems and Testing Technology.- Innovations in Tires and Wheels. Target audiences Automotive engineers and chassis specialists as well as students looking for state-of-the-art information regarding their field of activity - Lecturers and instructors at universities and universities of applied sciences with the main subject of automotive engineering - Experts, researchers and development engineers of the automotive and the supplying industry. Publisher ATZ live stands for top quality and a high level of specialist information and is part of Springer Nature, one of the leading publishing groups worldwide for scientific, educational and specialist literature. Partner TÜV SÜD is an international leading technical service organisation catering to the industry, mobility and certification segment.

Proceedings. 20. Workshop Computational Intelligence, Dortmund, 1. Dezember - 3. Dezember 2010 Springer

The aim of this book is to illustrate that advanced fuzzy clustering algorithms can be used not only for partitioning of the data. It can also be used for visualization, regression, classification and time-series analysis, hence fuzzy cluster analysis is a good approach to solve complex data mining and system identification problems. This book is oriented to undergraduate and postgraduate and is well suited for teaching purposes.