

Rolf Isermann
Marco Münchhof

Identification of Dynamic Systems



An Introduction with Applications



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Identification Of Dynamic Systems An Introduction With Applications

J.R. Raol,G. Girija,J. Singh



Identification Of Dynamic Systems An Introduction With Applications:

Identification of Dynamic Systems Rolf Isermann, Marco Münchhof, 2010-11-22 Precise dynamic models of processes are required for many applications ranging from control engineering to the natural sciences and economics Frequently such precise models cannot be derived using theoretical considerations alone Therefore they must be determined experimentally This book treats the determination of dynamic models based on measurements taken at the process which is known as system identification or process identification Both offline and online methods are presented i e methods that post process the measured data as well as methods that provide models during the measurement The book is theory oriented and application oriented and most methods covered have been used successfully in practical applications for many different processes Illustrative examples in this book with real measured data range from hydraulic and electric actuators up to combustion engines Real experimental data is also provided on the Springer webpage allowing readers to gather their first experience with the methods presented in this book Among others the book covers the following subjects determination of the non parametric frequency response fast Fourier transform correlation analysis parameter estimation with a focus on the method of Least Squares and modifications identification of time variant processes identification in closed loop identification of continuous time processes and subspace methods Some methods for nonlinear system identification are also considered such as the Extended Kalman filter and neural networks The different methods are compared by using a real three mass oscillator process a model of a drive train For many identification methods hints for the practical implementation and application are provided The book is intended to meet the needs of students and practicing engineers working in research and development design and manufacturing

Smart Electromechanical Systems Irina Leonidovna Tarasova, Boris Alexandrovich Kulik, 2024-08-20 Intelligent electromechanical systems SEMS are used in cyber physical systems that have the ability to integrate computing transmission and storage of information monitoring and management of objects of the physical world Modern intelligent robots are created based on CMS modules A distinctive feature of SEMS is the presence of a central nervous system CNS similar to a human one The Central Nervous System ensures that decisions about appropriate behavior are made in accordance with the goals of SEMS based on rational knowledge about the environment in which it operates and in accordance with its own technical and mental state For the Central nervous system the extraction and processing of this external information by the central nervous system is an integral part of the process of forming their situational control systems Moreover in order for SEMS to act expediently in a changing and unfamiliar environment and without human participation it is necessary to endow them with properties similar to the mental properties of animals since emotions and temperament are among the main assessments of the behavior of highly organized organisms Therefore it is quite natural to take into account the influence of emotions on decision making in conditions of incomplete information about the environment especially when SEMS interacts with a person to perform complex technological operations Despite the

existing technical difficulties a significant number of mathematical and software tools have accumulated to date providing the CNS SEMS with the ability to take into account the psyche when interacting with a person Limitations of sensory capabilities and computing power should be attributed to the limited cognitive abilities of artificial intelligence These features of the central nervous system of modern SEMS must be taken into account when creating mathematical and software tools for SEMS information and measurement systems for the formation of databases and knowledge for recognition and classification decision making and the formation of control actions

Frontiers in Advanced Control Systems Ginalber Luiz Serra, 2012-07-25 This book pretends to bring the state of art research results on advanced control from both the theoretical and practical perspectives The fundamental and advanced research results as well as the contributions in terms of the technical evolution of control theory are of particular interest This book can serve as a bridge between people who are working on the theoretical and practical research on control theory and facilitate the proposal of development of new control techniques and its applications In addition this book presents educational importance to help students and researchers to know the frontiers of the control technology

Identification and System Parameter Estimation 1982 G. A. Bekey, G. N. Saridis, 2016-06-06 Identification and System Parameter Estimation 1982 covers the proceedings of the Sixth International Federation of Automatic Control IFAC Symposium The book also serves as a tribute to Dr Naum S Rajbman The text covers issues concerning identification and estimation such as increasing interrelationships between identification estimation and other aspects of system theory including control theory signal processing experimental design numerical mathematics pattern recognition and information theory The book also provides coverage regarding the application and problems faced by several engineering and scientific fields that use identification and estimation such as biological systems traffic control geophysics aeronautics robotics economics and power systems Researchers from all scientific fields will find this book a great reference material since it presents topics that concern various disciplines

Unmanned Driving Systems for Smart Trains Hui Liu, 2020-11-13 Unmanned Driving Systems for Smart Trains explores the core technologies involved in unmanned driving systems for smart railways and trains from foundational theory to the latest advances The volume introduces the key technologies research results and frontiers of the field Each chapter includes practical cases to ground theory in practice Seven chapters cover key aspects of unmanned driving systems for smart trains including performance evaluation algorithm based reasoning and learning strategy main control parameters data mining and processing energy saving optimization and control and intelligent algorithm simulation platforms This book will help researchers find solutions in developing better unmanned driving systems Responds to the expansion of smart railways and the adoption of unmanned global systems Covers core technologies of unmanned driving systems for smart trains Details a large number of case studies and experimental designs for unmanned railway systems Adopts a multidisciplinary view where disciplines intersect at key points Gives both foundational theory and the latest theoretical and practical advances for unmanned railways

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

Neural Network Systems Techniques and Applications, 1998-02-09 The book emphasizes neural network structures for achieving practical and effective systems and provides many examples Practitioners researchers and students in industrial manufacturing electrical mechanical and production engineering will find this volume a unique and comprehensive reference source for diverse application methodologies Control and Dynamic Systems covers the important topics of highly effective Orthogonal Activation Function Based Neural Network System Architecture multi layer recurrent neural networks for synthesizing and implementing real time linear control adaptive control of unknown nonlinear dynamical systems Optimal Tracking Neural Controller techniques a consideration of unified approximation theory and applications techniques for the determination of multi variable nonlinear model structures for dynamic systems with a detailed treatment of relevant system model input determination High Order Neural Networks and Recurrent High Order Neural Networks High Order Moment Neural Array Systems Online Learning Neural Network controllers and Radial Bias Function techniques Coverage includes Orthogonal Activation Function Based Neural Network System Architecture OAFNN Multilayer recurrent neural networks for synthesizing and implementing real time linear control Adaptive control of unknown nonlinear dynamical systems Optimal Tracking Neural Controller techniques Consideration of unified approximation theory and applications Techniques for determining multivariable nonlinear model structures for dynamic systems with a detailed treatment of relevant system model input determination

Multivariable Technological Systems D.P. Atherton, 2014-06-28 Recent results in the development and application of analysis and design techniques for the control of multivariable systems are discussed in this volume

Applications of Artificial Intelligence Techniques in Engineering Hasmat Malik, Smriti Srivastava, Yog Raj Sood, Aamir Ahmad, 2018-09-18 The book is a collection of high quality peer reviewed innovative research papers from the International Conference on Signals Machines and Automation SIGMA 2018 held at Netaji Subhas Institute of Technology NSIT Delhi India The conference offered researchers from academic and industry the opportunity to present their original work and exchange ideas information techniques and applications in the field of computational intelligence artificial intelligence and machine intelligence The book is divided into two volumes discussing a wide variety of industrial engineering and scientific applications of the emerging

techniques *Modelling and Parameter Estimation of Dynamic Systems* J.R. Rao, G. Girija, J. Singh, 2004-08-13 This book presents a detailed examination of the estimation techniques and modeling problems The theory is furnished with several illustrations and computer programs to promote better understanding of system modeling and parameter estimation

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