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ASME 66-WA/AUT-10

RIVERS LAYLA

Optimal Experiment Design for Dynamic System Identification Ann Arbor, Mich. : University Microfilms International
The objective of this thesis is to estimate the parameters of dynamic systems using the Sliding Mode Control Technique.
Theory and Formulation Springer
This book gives an in-depth introduction to the areas of modeling, identification, simulation, and optimization. These scientific topics play an increasingly dominant part in many engineering areas such as electrotechnology, mechanical engineering, aerospace, and physics. This book represents a unique and concise treatment of the mutual interactions among these topics. Techniques for solving general nonlinear optimization problems as they arise in identification and many synthesis and design methods are detailed. The main points in deriving mathematical models via prior knowledge concerning the physics describing a system are emphasized. Several chapters discuss the identification of black-box models. Simulation is introduced as a numerical tool for calculating time responses of almost any mathematical model. The last chapter covers optimization, a generally applicable tool for formulating and solving many engineering problems.
Modeling, Identification and Simulation of Dynamical Systems Butterworth-Heinemann
Written by a recognized authority in the field of identification and control, this book draws together into a single volume the important aspects of system identification

AND physical modelling. KEY TOPICS: Explores techniques used to construct mathematical models of systems based on knowledge from physics, chemistry, biology, etc. (e.g., techniques with so called bond-graphs, as well those which use computer algebra for the modeling work). Explains system identification techniques used to infer knowledge about the behavior of dynamic systems based on observations of the various input and output signals that are available for measurement. Shows how both types of techniques need to be applied in any given practical modeling situation. Considers applications, primarily simulation. For practicing engineers who are faced with problems of modeling.

Blind Identification of Structured Dynamic Systems Springer Nature

This book gives an in-depth introduction to the areas of modeling, identification, simulation, and optimization. These scientific topics play an increasingly dominant part in many engineering areas such as electrotechnology, mechanical engineering, aerospace, and physics. This book represents a unique and concise treatment of the mutual interactions among these topics. Techniques for solving general nonlinear optimization problems as they arise in identification and many synthesis and design methods are detailed. The main points in deriving mathematical models via prior knowledge concerning the physics describing a system are emphasized. Several chapters discuss the identification of black-box models. Simulation is introduced as a numerical tool for calculating time responses of almost any mathematical model. The last chapter covers optimization, a generally applicable tool for formulating and solving many engineering problems.

Dynamic System Identification: Experiment Design and Data Analysis Createspace Independent Publishing Platform

Identification of Dynamic SystemsAn Introduction with ApplicationsSpringer Science & Business Media

Modeling and Identification of Dynamic Systems - Exercises Cambridge University Press

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.

Modeling, Identification and Simulation of Dynamical Systems Prentice Hall

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.

On-line Identification of Dynamic Systems Using Modifications of Recursive Least Squares Method John Wiley & Sons

This introduction and textbook familiarizes engineers with the use of mathematical and computational modeling and simulation in a way that develops their understanding of the solution characteristics of a broad class of real-world problems. The relevant basic and advanced methodologies are explained in detail, with special emphasis on ill-defined problems. Some fifteen simulation systems are presented on the language and the logical level. Moreover, the reader also can accumulate an experiential overview by studying the wide variety of case studies spanning much of science and engineering. The latter are briefly described within the book but their full versions as well as some simulation software demos are available on the Web. The book can be used for courses on various levels as well as for self-study. Advanced sections are identified and can be skipped in a first reading or in undergraduate courses.

From Classical Approaches to Neural Networks, Fuzzy Models, and Gaussian Processes Springer Science & Business Media

Marine Systems Identification, Modeling and Control is a concise, stand-alone resource covering the theory and practice of dynamic systems and control for marine engineering students and professionals. Developed from a distance learning CPD course on marine control taught by the authors, the book presents the essentials of the subject, including system representation and transfer, feedback control and closed loop stability. Simulation code and worked examples are provided for both Scilab and MATLAB, making it suitable for both those without access to expensive software and those using MATLAB in a professional setting. This title considers the key topics without superfluous detail and is illustrated with marine industry examples. Concise and practical, covering the relevant theory without excessive detail Industry-specific examples and applications for marine engineering students and professionals Clearly presents key topics of the subject, including system representation and transfer, feedback control and closed loop stability, making it ideal for self-study or reference Simulation code and worked examples using Scilab and MATLAB provided on the book's companion website Modelling and Parameter Estimation of Dynamic Systems CRC Press

System Identification Toolbox provides MATLAB functions, Simulink blocks, and an app for constructing mathematical models of dynamic systems from measured input-output data. It lets you create and use models of dynamic systems not easily modeled from first principles or specifications. You can use time-domain and frequency-domain input-output data to identify continuous-time and discrete-time transfer functions, process models, and state-space models. The toolbox also provides algorithms for embedded online parameter estimation. The toolbox provides identification techniques such as maximum likelihood, prediction-error minimization (PEM), and subspace system identification. To represent nonlinear system dynamics, you can estimate Hammerstein-Weiner models and nonlinear ARX models with wavelet network, tree-partition, and sigmoid network nonlinearities. The toolbox performs grey-box system identification for estimating parameters of a user-defined model. You can use the identified model for system response prediction and plant modeling in Simulink. The toolbox also supports time-series data modeling and time-series forecasting. The most important content that this book provides are the following: - System Identification Overview - What Is System Identification? - About Dynamic Systems and Models - System Identification Requires Measured Data - Building Models from Data - Black-Box Modeling - Grey-Box Modeling - Evaluating Model Quality - When to Use the App vs. the Command Line - System Identification Workflow - Commands for Model Estimation - Linear Model Identification - Identify Linear Models Using System Identification App - Preparing Data for System Identification - Saving the Session - Estimating Linear Models Using Quick Start - Estimating Linear Models - Viewing Model Parameters - Exporting the Model to the MATLAB Workspace - Exporting the Model to the Linear System Analyzer - Identify Linear Models Using the Command Line - Preparing Data - Estimating Impulse Response Models - Estimating Delays in the Multiple-Input System - Estimating Model Orders Using an ARX Model Structure - Estimating Transfer Functions - Estimating Process Models - Estimating Black-Box Polynomial Models - Simulating and Predicting Model Output - Identify Low-Order Transfer Functions (Process Models) - Using System Identification App - What Is a Continuous-Time Process Model?

- Preparing Data for System Identification - Estimating a Second-Order Transfer Function (Process Model) - with Complex Poles - Estimating a Process Model with a Noise Component - Viewing Model Parameters - Exporting the Model to the MATLAB Workspace - Simulating a System Identification Toolbox Model in Simulink Software - Estimating Models Using Frequency-Domain Data - Advantages of Using Frequency-Domain Data - Representing Frequency-Domain Data in the Toolbox - Preprocessing Frequency-Domain Data for Model - Estimation - Estimating Linear Parametric Models - Validating Estimated Model - Next Steps After Identifying a Model - Nonlinear Model Identification - Identify Nonlinear Black-Box Models Using System - Identification App - What Are Nonlinear Black-Box Models? - Preparing Data - Estimating Nonlinear ARX Models - Estimating Hammerstein-Wiener Models

Parameter Identification of Dynamic Systems Using Traditional and Higher Order Sliding Mode Control Identification of Dynamic SystemsAn Introduction with Applications

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.

Mathematical and Computational Modeling and Simulation Springer

This book concentrates on the problem of accurate modeling of linear systems. It presents a thorough description of a method of modeling a linear dynamic invariant system by its transfer function. The first two chapters provide a general introduction and review for those readers who are unfamiliar with identification theory so that they have a sufficient background knowledge for understanding the methods described later. The main body of the book looks at the basic method used by the authors to estimate the parameter of the transfer function, how it is possible to optimize the excitation signals. Further chapters extend the estimation method proposed. Applications are then discussed and the book concludes with practical guidelines which illustrate the method and offer some rules-of-thumb.

A Present - Day Problems in Identification of Dynamic Systems - a Review Springer

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.

An Introduction with Applications CRC Press

Mathematical models of real life systems and processes are essential in today's industrial work. To be able to construct such models is therefore a fundamental skill in modern engineering...

A Present-day Problems in Identification of Dynamic Systems Elsevier

This book contains examples and exercises with modeling problems together with complete solutions. The contents is tailored to the book Ljung-Glad: Modeling and Identification of Dynamic Systems (Studentlitteratur, 2016). The exercises are of different levels of difficulty and cover general modeling principles (such as bond graphs) as well as practical tools like Modelica and Simscape. System identification, model and signal properties are also covered together with basic techniques for simulation. Most of the problems deal with issues from industrial applications, but also economic, social and medical cases are covered. The text requires certain knowledge in linear algebra, signal and systems and basic familiarity with physics and statistics. The computer exercises assume access to basic software such as Matlab and Simulink, and to some extent

Modelica/Dymola/Simscape. The book is suitable for Master level courses in engineering, but also for practicing engineers.
Identification of dynamic systems Springer Science & Business Media
Dynamic System Identification: Experiment Design and Data Analysis
Identification of Linear Dynamic Systems IET
This book enables readers to understand system identification and linear system modeling through 100 practical exercises without requiring complex theoretical knowledge. The contents encompass state-of-the-art system identification methods, with both time and frequency domain system identification methods covered, including the pros and cons of each. Each chapter features MATLAB exercises, discussions of the exercises, accompanying MATLAB downloads, and larger projects that serve as potential assignments in this learn-by-doing resource.
From Classical Approaches to Neural Networks and Fuzzy Models Springer Science & Business Media
This book presents a detailed examination of the estimation techniques and problems in dynamic systems. Containing several illustrations and computer programs, the book promotes a better understanding of system modelling and parameter estimation. Parameter estimation involves observation of a dynamic system to develop mathematical models that represent the system dynamics. With the increasing use of high speed digital computers, elegant and innovative techniques like filter error method, H° and artificial neural networks are finding more and more use in parameter estimation problems. The material is presented in an accessible manner and enables the user to implement and execute the programs and, therefore, gain first-hand experience of the estimation progress.
Machine Learning, Dynamical Systems, and Control Springer Science & Business Media
This beginning graduate textbook teaches data science and machine learning methods for modeling, prediction, and control of complex systems.
John Wiley & Sons
Identification of Dynamic Systems and Selection of Suitable Model.