System Identification Soderstrom Solution Manual Problems

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Adaptive Control

Master Techniques and Successfully Build Models Using a Single Resource Vital to all data-driven or measurement-based process operations, system identification is an interface that is based on observational science, and centers on developing mathematical models from observed data. Principles of System Identification: Theory and Practice is an introductory-level book that presents the basic foundations and underlying methods relevant to system identification. The overall scope of the book focuses on system identification with an emphasis on practice, and concentrates most specifically on discrete-time linear system identification. Useful for Both Theory and Practice The book presents the foundational pillars of identification, namely, the theory of discrete-time LTI systems, the basics of signal processing, the theory of random processes, and estimation theory. It explains the core theoretical concepts of building (linear) dynamic models from experimental data, as well as the experimental and practical aspects of identification. The author offers glimpses of modern developments in this area, and provides numerical and simulation-based examples, case studies, end-of-chapter problems, and other ample references to code for illustration and training. Comprising 26 chapters, and ideal for coursework and self-study, this extensive text: Provides the essential concepts of identification Lays down the foundations of mathematical descriptions of systems, random processes, and estimation in the context of identification Discusses the theory pertaining to non-parametric and parametric models for deterministic-plus-stochastic LTI systems in detail Demonstrates the concepts and methods of identification on different case-studies Presents a gradual development of state-space identification and greybox modeling Offers an overview of advanced topics of identification namely the linear time-varying (LTV), non-linear, and closed-loop identification Discusses a multivariable approach to identification using the iterative principal component analysis Embeds MATLAB® codes for illustrated examples in the text at the respective points Principles of System Identification: Theory and Practice presents a formal base in LTI deterministic and stochastic systems modeling and estimation theory; it is a one-stop reference for introductory to moderately advanced courses on system identification, as well as introductory courses on stochastic signal processing or time-series analysis.The MATLAB scripts and SIMULINK models used as examples and case studies in the book are also available on the author's website: http://arunkt.wix.com/homepage#!textbook/c397

Discrete-time Stochastic Systems

Automatic Autocorrelation and Spectral Analysis gives random data a language to communicate the information they contain objectively. In the current practice of spectral analysis, subjective decisions have to be made all of which influence the final spectral estimate and mean that different analysts obtain different results from the same stationary stochastic observations. Statistical signal processing can overcome this difficulty, producing a unique solution for any set of observations but that solution is only acceptable if it is close to the best attainable accuracy for most types of stationary data. Automatic Autocorrelation and Spectral Analysis describes a method which fulfils the above near-optimal-solution criterion. It takes advantage of greater computing power and robust algorithms to produce enough candidate models to be sure of providing a suitable candidate for given data. Improved order selection quality guarantees that one of the best (and often the best) will be selected automatically. The data themselves suggest their best representation. Should the analyst wish to intervene, alternatives can be provided. Written for graduate signal processing students and for researchers and engineers using time series analysis for practical applications ranging from breakdown prevention in heavy machinery to measuring lung noise for medical diagnosis, this text offers: • tuition in how power spectral density and the autocorrelation function of stochastic data can be estimated and interpreted in time series models; • extensive support for the MATLAB® ARMAsel toolbox; • applications showing the methods in action; • appropriate mathematics for students to apply the methods with references for those who wish to develop them further.

Instrumental Variable Methods for System Identification

This volume surveys the major results and techniques of analysis in the field of adaptive control. Focusing on linear, continuous time, single-input, single-output systems, the authors offer a clear, conceptual presentation of adaptive methods, enabling a critical evaluation of these techniques and suggesting avenues of further development. 1989 edition.

Theory and Practice of Recursive Identification

This book constitutes the proceedings of the 12th International Conference on Latent Variable Analysis and Signal Separation, LVA/ICS 2015, held in Liberec, Czech Republic, in August 2015. The 61 revised full papers presented – 29 accepted as oral presentations and 32 accepted as poster presentations – were carefully reviewed and selected from numerous submissions. Five special topics are addressed: tensor-based methods for blind signal separation; deep neural networks for supervised speech separation/enhancement; joined analysis of multiple datasets, data fusion, and related topics; advances in nonlinear blind source separation; sparse and low rank modeling for acoustic signal processing.

Rotorcraft System Identification

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.

System Modeling and Identification

Models are commonly used to simulate events and processes, and can be constructed from measured data using system identification. The common way is to model the system from input to output, but in this thesis we want to obtain the inverse of the system. Power amplifiers (PAs) used in communication devices can be nonlinear, and this causes interference in adjacent transmitting channels. A prefilter, called predistorter, can be used to invert the effects of the PA, such that the combination of predistorter and PA reconstructs an amplified version of the input signal. In this thesis, the predistortion problem has been investigated for outphasing power amplifiers, where the input signal is decomposed into two branches that are amplified separately by highly efficient nonlinear amplifiers and then recombined. We have formulated a model structure describing the imperfections in an outphasing abbrPA and the matching ideal predistorter. The predistorter can be estimated from measured data in different ways. Here, the initially nonconvex optimization problem has been developed into a convex problem. The predistorters have been evaluated in measurements. The goal with the inverse models in this thesis is to use them in cascade with the systems to reconstruct the original input. It is shown that the problems of identifying a model of a preinverse and a postinverse are fundamentally different. It turns out that the true inverse is not necessarily the best one when noise is present, and that other models and structures can lead to better inversion results. To construct a predistorter (for a PA, for example), a model of the inverse is used, and different methods can be used for the estimation. One common method is to estimate a postinverse, and then using it as a preinverse, making it straightforward to try out different model structures. Another is to construct a model of the system and then use it to estimate a preinverse in a second step. This method identifies the inverse in the setup it will be used, but leads to a complicated optimization problem. A third option is to model the forward system and then invert it. This method can be understood using standard identification theory in contrast to the ones above, but the model is tuned for the forward system, not the inverse. Models obtained using the various methods capture different properties of the system, and a more detailed analysis of the methods is presented for linear time-invariant systems and linear approximations of block-oriented systems. The theory is also illustrated in examples. When a preinverse is used, the input to the system will be changed, and typically the input data will be different than the original input. This is why the estimation of preinverses is more complicated than for postinverses, and one set of experimental data is not enough. Here, we have shown that identifying a preinverse in series with the system in repeated experiments can improve the inversion performance.

Adaptive Filters

Subspace Identification for Linear Systems focuses on the theory, implementation and applications of subspace identification algorithms for linear time-invariant finite- dimensional dynamical systems. These algorithms allow for a fast, straightforward and accurate determination of linear multivariable models from measured input-output data. The theory of subspace identification algorithms is presented in detail. Several chapters are devoted to deterministic, stochastic and combined deterministic-stochastic subspace identification algorithms. For each case, the geometric properties are stated in a main 'subspace' Theorem. Relations to existing algorithms and literature are explored, as are the interconnections between different subspace algorithms. The subspace identification theory is linked to the theory of frequency weighted model reduction, which leads to new interpretations and insights. The implementation of subspace identification algorithms is discussed in terms of the robust and computationally efficient RQ and singular value decompositions, which are well-established algorithms from numerical linear algebra. The algorithms are implemented in combination with a whole set of classical identification algorithms, processing and validation tools in Xmath's ISID, a commercially available graphical user interface toolbox. The basic subspace algorithms in the book are also implemented in a set of Matlab files accompanying the book. An application of ISID to an industrial glass tube manufacturing process is presented in detail, illustrating the power and user-friendliness of the subspace identification algorithms and of their implementation in ISID. The identified model allows for an optimal control of the process, leading to a significant enhancement of the production quality. The applicability of subspace identification algorithms in industry is further illustrated with the application of the Matlab files to ten practical problems. Since all necessary data and Matlab files are included, the reader can easily step through these applications, and thus get more insight in the algorithms. Subspace Identification for Linear Systems is an important reference for all researchers in system theory, control theory, signal processing, automization, mechatronics, chemical, electrical, mechanical and aeronautical engineering.

Adaptive Filtering

An exploration of physical modelling and experimental issues that considers identification of structured models such as continuous-time linear systems, multidimensional systems and nonlinear systems. It gives a broad perspective on modelling, identification and its applications.

System Identification

This book proposes neural networks algorithms and advanced machine learning techniques for processing nonlinear dynamic signals such as audio, speech, financial signals, feedback loops, waveform generation, filtering, equalization, signals from arrays of sensors, and perturbations in the automatic control of industrial production processes. It also discusses the drastic changes in financial, economic, and work processes that are currently being experienced by the computational and engineering sciences community. Addresses key aspects, such as the integration of neural algorithms and procedures for the recognition, the analysis and detection of dynamic complex structures and the implementation of systems for discovering patterns in data, the book highlights the commonalities between computational intelligence (CI) and information and communications technologies (ICT) to promote transversal skills and sophisticated processing techniques. This book is a valuable resource for a. The academic research community b. The ICT market c. PhD students and early stage researchers d. Companies, research institutes e. Representatives from industry and standardization bodies

System Identification

System Identification shows the student reader how to approach the system identification problem in a systematic fashion. The process is divided into three basic steps: experimental design and data collection; model structure selection and parameter estimation; and model validation, each of which is the subject of one or more parts of the text. Following an introduction on system theory, particularly in relation to model representation and model properties, the book contains four parts covering: • data-based identification – non-parametric methods for use when prior system knowledge is very limited; • time-invariant identification for systems with constant parameters; • time-varying systems identification, primarily with recursive estimation techniques; and • model validation methods. A fifth part, composed of appendices, covers the various aspects of the underlying mathematics needed to begin using the text. The book uses essentially semi-physical or gray-box modeling methods although data-based, transfer-function system descriptions are also introduced. The approach is problem-based rather than rigorously mathematical. The use of finite input–output data is demonstrated for frequency- and time-domain identification in static, dynamic, linear, nonlinear, time-invariant and time-varying systems. Simple examples are used to show readers how to perform and emulate the identification steps involved in various control design methods with more complex illustrations derived from real physical, chemical and biological applications being used to demonstrate the practical applicability of the methods described. End-of-chapter exercises (for which a downloadable instructors' Solutions Manual is available from fill in URL here) will both help students to assimilate what they have learned and make the book suitable for self-tuition by practitioners looking to brush up on modern techniques. Graduate and final-year undergraduate students will find this text to be a practical and realistic course in system identification that can be used for assessing the processes of a variety of engineering disciplines. System Identification will help academic instructors teaching control-related to give their students a good understanding of identification methods that can be used in the real world without the encumbrance of undue mathematical detail.

Dynamic System Identification: Experiment Design and Data Analysis

A textbook designed for senior undergraduate and graduate level classroom courses on system identification. Examples and problems. Annotation copyright Book News, Inc. Portland, Or.

Latent Variable Analysis and Signal Separation

This book presents an introduction to spectral analysis that is designed for either course use or self-study. Clear and concise in approach, it develops a firm understanding of tools and techniques as well as a solid background for performing research.Topics covered include nonparametric spectrum analysis (both periodogram-based approaches and filter- bank approaches), parametric spectral analysis using rational spectral models (AR, MA, and ARMA models), parametric method for line spectra, and spatial (array) signal processing. Analytical and Matlab-based computer exercises are included to develop both analytical skills and hands-on experience.

Run-to-Run Control in Semiconductor Manufacturing

A textbook designed for senior undergraduate and graduate level classroom courses on system identification. Examples and problems. Annotation copyright Book News, Inc. Portland, Or.

Inverse system identification with applications in predistortion

Increasing complexity and performance and reliability expectations make modeling of automotive system both more difficult and more urgent. Automotive control has slowly evolved from an add-on to classical engine and vehicle design to a key technology to enforce consumption, pollution and safety limits. Modeling, however, is still mainly based on classical methods, even though much progress has been done in the identification community to speed it up and improve it. This book, the product of a workshop of representatives of different communities, offers an insight on how to close the gap and exploit this progress for the next generations of vehicles.

Identification of Dynamic Systems

As the first volume in a new annual survey , Applied and Computational Control, Signals, and Circuits is an interdisciplinary publication which provides surveys, expository papers, algorithms, and software reviews. These volumes address significant new developments, applications, and computational methods in control, signal processing, circuit design and analysis. The goal is to provide authoritative and accessible accounts of the rapid development in computational engineering methods, applications, and algorithms. Each volume contains surveys and chapters representing a balance of coverage from the major areas of control, signals, and circuits. The contributions, selected by an editorial board comprised of leading researchers, contain all necessary background information and are extensive presentations of the topics. Topics and Features: Control, filtering, and systems identification Signal and image processing Circuit simulation Linear-control-systems software library, SLICOT Array algorithms Researchers, practitioners, and professionals in computer science, scientific computing, and engineering will find the volume essential for keeping abreast of the latest developments and for critically assessing new software tools. Table of Contents Chapter 1 Discrete Event Systems: The State of the Art and New Directions 1.1 Introduction 1.2 ES Modeling Framework 1.3 Review of the State of the Art in DES Theory 1.4 New Directions in DES Theory 1.5 Decentralized Control and Optimization 1.6 Failure Diagnosis 1.7 Nondeterministic Supervisory Control 1.8 Hybrid Systems and Optimal Control Chapter 2 Array Algorithms for H2 and H-Infinity Estimation 2.1 Introduction 2.2 H2 Square-Root Array Algorithms 2.3 H-Infinity Square-Root Array Algorithms 2.4 H2 Fast Array Algorithms 2.5 H-Infinity Fast

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System Identification

Mastering System Identification in 100 Exercises

A self-contained, highly motivated and comprehensive account of basic methods for analysis and application of linear systems that arise in signal processing problems in communications, control, system identification and digital filtering.

Journal A.

Dynamic System Identification: Experiment Design and Data Analysis

Control System Applications

Control technology permeates every aspect of our lives. We rely on them to perform a wide variety of tasks without giving much thought to the origins of the technology or how it became such an important part of our lives. Control System Applications covers the uses of control systems, both in the common and in the uncommon areas of our lives. From the everyday to the unusual, it's all here. From process control to human-in-the-loop control, this book provides illustrations and examples of how these systems are applied. Each chapter contains an introduction to the application, a section defining terms and references, and a section on further readings that help you understand and use the techniques in your work environment. Highly readable and comprehensive, Control System Applications explores the uses of control systems. It illustrates the diversity of control systems and provides examples of how the theory can be applied to specific practical problems. It contains information about aspec ts of control that are not fully captured by the theory, such as techniques for protecting against controller failure and the role of cost and complexity in specifying controller designs.

Subspace Identification for Linear Systems

Model Predictive Control is an important technique used in the process control industries. It has developed considerably in the last few years, because it is the most general way of posing the process control problem in the time domain. The Model Predictive Control formulation integrates optimal control, stochastic control, control of processes with dead time, multivariable control and future references. The finite control horizon makes it possible to handle constraints and non linear processes in general which are frequently found in industry. Focusing on implementation issues for Model Predictive Controllers in industry, it fills the gap between the empirical way practitioners use control algorithms and the sometimes abstractly formulated techniques developed by researchers. The text is firmly based on material from lectures given to senior undergraduate and graduate students and articles written by the authors.

Neural Advances in Processing Nonlinear Dynamic Signals

Automatic Autocorrelation and Spectral Analysis

This is the first book dedicated to direct continuous-time model identification for 15 years. It cuts down on time spent hunting through journals by providing an overview of much recent research in an increasingly busy field. The CONTSID toolbox discussed in the final chapter gives an overview of developments and practical examples in which MATLAB® can be used for direct time-domain identification of continuous-time systems. This is a valuable reference for a broad audience.

Soft Computing Methods for Practical Environment Solutions: Techniques and Studies

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.

System Identification

Systems and control theory has experienced significant development in the past few decades. New techniques have emerged which hold enormous potential for industrial applications, and which have therefore also attracted much interest from academic researchers. However, the impact of these developments on the process industries has been limited. The purpose of Multivariable System Identification for Process Control is to bridge the gap between theory and application, and to provide industrial solutions, based on sound scientific theory, to process identification problems. The book is organized in a reader-friendly way, starting with the simplest methods, and then gradually introducing more complex techniques. Thus, the reader is offered clear physical insight without recourse to large amounts of mathematics. Each method is covered in a single chapter or section, and experimental design is explained before any identification algorithms are discussed. The many simulation examples and industrial case studies demonstrate the power and efficiency of process identification, helping to make the theory more applicable. MatlabTM M-files, designed to help the reader to learn identification in a computing environment, are included.

Supplemental Ways for Improving International Stability 1998

Over recent years, a number of people actively involved in engineering, but also in other fields, have worked on the topic of international stability. Workshops have been held in various places and organized by different people and institutions. This conference, the sixth event in the SWIIS series, continued the tradition set in the earlier five SWIIS meetings. The goal was the beneficial application of systems engineering methods onto description of conditions, in which nations or groups interact with one another. Scientists from other fields such as political science, economics, social science, and international studies also had a platform to present and discuss their ideas. In the technical program of this conference, 2 survey papers and 19 regular papers - grouped into 8 sessions - were presented. Papers were given in the following areas: Methodological analysis; Investigation of development: stability, sustainable development; Modelling of stability; Application of control principles to international stability; International policy co-operation; Cultural and educational aspects in international stability; East/West/North/South relationships; Global development - regional impact; and Negotiation and mediation in conflict.

Identification for Automotive Systems

A unique treatment of signal processing using a model-basedperspective Signal processing is primarily aimed at extracting usefulinformation, while rejecting the extraneous from noisy data. Ifsignal levels are high, then basic techniques can be applied.However, low signal levels require using the underlying physics tocorrect the problem causing these low levels and extracting thedesired information. Model-based signal processing incorporates thephysical phenomena, measurements, and noise in the form ofmathematical models to solve this problem. Not only does theapproach enable signal processors to work directly in terms of theproblem's physics, instrumentation, and uncertainties, but itprovides far superior performance over the standard techniques.Model-based signal processing is both a modeler's as well as asignal processor's tool. Model-Based Signal Processing develops the model-based approach ina unified manner and follows it through the text in the algorithms,examples, applications, and case studies. The approach, coupledwith the hierarchy of physics-based models that the authordevelops, including linear as well as nonlinear representations,makes it a unique contribution to the field of signalprocessing. The text includes parametric (e.g., autoregressive or all-pole),sinusoidal, wave-based, and state-space models as some of the modelsets with its focus on how they may be used to solve signalprocessing problems. Special features are provided that assistreaders in understanding the material and learning how to applytheir new knowledge to solving real-life problems. * Unified treatment of well-known signal processing modelsincluding physics-based model sets * Simple applications demonstrate how the model-based approachworks, while detailed case studies demonstrate problem solutions intheir entirety from concept to model development, throughsimulation, application to real data, and detailed performanceanalysis * Summaries provided with each chapter ensure that readersunderstand the key points needed to move forward in the text aswell as MATLAB(r) Notes that describe the key commands andtoolboxes readily available to perform the algorithmsdiscussed * References lead to more in-depth coverage of specializedtopics * Problem sets test readers' knowledge and help them put their newskills into practice The author demonstrates how the basic idea of model-based signalprocessing is a highly effective and natural way to solve bothbasic as well as complex processing problems. Designed as agraduate-level text, this book is also essential reading forpracticing signal-processing professionals and scientists, who willfind the variety of case studies to be invaluable. An Instructor's Manual presenting detailed solutions to all theproblems in the book is available from the Wiley editorialdepartment

Linear Systems

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.

Flight Test System Identification

This comprehensive introduction to the estimation and control of dynamic stochastic systems provides complete derivations of key results. The second edition includes improved and updated material, and a new presentation of polynomial control and new derivation of linear-quadratic-Gaussian control.

Model-Based Signal Processing

With the demand for more advanced fighter aircraft, relying on unstable flight mechanical characteristics to gain flight performance, more focus has been put on model-based system engineering to help with the design work. The flight control system design is one important part that relies on this modeling. Therefore, it has become more important to develop flight mechanical models that are highly accurate in the whole flight envelope. For today's modern fighter aircraft, the basic flight mechanical characteristics change between linear and nonlinear as well as stable and unstable as an effect of the desired capability of advanced maneuvering at subsonic, transonic and supersonic speeds. This thesis combines the subject of system identification, which is the art of building mathematical models of dynamical systems based on measurements, with aeronautical engineering in order to find methods for identifying flight mechanical characteristics. Here, some challenging aeronautical identification problems, estimating model parameters from flight-testing, are treated. Two aspects are considered. The first is online identification during flight-testing with the intent to aid the engineers in the analysis process when looking at the flight mechanical characteristics. This will also ensure that enough information is available in the resulting test data for post-flight analysis. Here, a frequency domain method is used. An existing method has been developed further by including an Instrumental Variable approach to take care of noisy data including atmospheric turbulence and by a sensor-fusion step to handle varying excitation during an experiment. The method treats linear systems that can be both stable and unstable working under feedback control. An experiment has been performed on a radio-controlled demonstrator aircraft. For this, multisine input signals have been designed and the results show that it is possible to perform more time-efficient flight-testing compared with standard input signals. The other aspect is post-flight identification of nonlinear characteristics. Here the properties of a parameterized observer approach, using a prediction-error method, are investigated. This approach is compared with four other methods for some test cases. It is shown that this parameterized observer approach is the most robust one with respect to noise disturbances and initial offsets. Another attractive property is that no user parameters have to be tuned by the engineers in order to get the best performance. All methods in this thesis have been validated on simulated data where the system is known, and have also been tested on real flight test data. Both of the investigated approaches show promising results.

Process Control

This book presents an overview of the different errors-in-variables (EIV) methods that can be used for system identification. Readers will explore the properties of an EIV problem. Such problems play an important role when the purpose is the determination of the physical laws that describe the process, rather than the prediction or control of its future behaviour. EIV problems typically occur when the purpose of the modelling is to get physical insight into a process. Identifiability of the model parameters for EIV problems is a non-trivial issue, and sufficient conditions for identifiability are given. The author covers various modelling aspects which, taken together, can find a solution, including the characterization of noise properties, extension to multivariable systems, and continuous-time models. The book finds solutions that are constituted of methods that are compatible with a set of noisy data, which traditional approaches to solutions, such as (total) least squares, do not find. A number of identification methods for the EIV problem are presented. Each method is accompanied with a detailed analysis based on statistical theory, and the relationship between the different methods is explained. A multitude of methods are covered, including: instrumental variables methods; methods based on bias-compensation; covariance matching methods; and prediction error and maximum-likelihood methods. The book shows how many of the methods can be applied in either the time or the frequency domain and provides special methods adapted to the case of periodic excitation. It concludes with a chapter specifically devoted to practical aspects and user perspectives that will facilitate the transfer of the theoretical material to application in real systems. Errors-in-Variables Methods in System Identification gives readers the possibility of recovering true system dynamics from noisy measurements, while solving over-determined systems of equations, making it suitable for statisticians and mathematicians alike. The book also acts as a reference for researchers and computer engineers because of its detailed exploration of EIV problems.

Principles of System Identification

Stochastic Systems

Electrical Engineering System Identification A Frequency DomainApproach How does one model a linear dynamic system from noisydata? This book presents a general approach to this problem, withboth practical examples and theoretical discussions that give thereader a sound understanding of the subject and of the pitfallsthat might occur on the road from raw data to validated model. Theemphasis is on robust methods that can be used with a minimum ofuser interaction. Readers in many fields of engineering will gainknowledge about: * Choice of experimental setup and experiment design * Automatic characterization of disturbing noise * Generation of a good plant model * Detection, qualification, and quantification of nonlineardistortions * Identification of continuous- and discrete-time models * Improved model validation tools and from the theoretical side about: * System identification * Interrelations between time- and frequency-domainapproaches * Stochastic properties of the estimators * Stochastic analysis System Identification: A Frequency Domain Approach is written forpracticing engineers and scientists who do not want to delve intomathematical details of proofs. Also, it is written for researcherswho wish to learn more about the theoretical aspects of the proofs.Several of the introductory chapters are suitable forundergraduates. Each chapter begins with an abstract and ends withexercises, and examples are given throughout.

Nonlinear System Identification

Run-to-run (R2R) control is cutting-edge technology that allows modification of a product recipe between machine "runs," thereby minimizing process drift, shift, and variability-and with them, costs. Its effectiveness has been demonstrated in a variety of processes, such as vapor phase epitaxy, lithography, and chemical mechanical planarization. The only barrier to the semiconductor industry's widespread adoption of this highly effective process control is a lack of understanding of the technology. Run to Run Control in Semiconductor Manufacturing overcomes that barrier by offering in-depth analyses of R2R control.

Introduction to Spectral Analysis

Adaptive filtering is a topic of immense practical and theoretical value, having applications in areas ranging from digital and wireless communications to biomedical systems. This book enables readers to gain a gradual and solid introduction to the subject, its applications to a variety of topical problems, existing limitations, and extensions of current theories. The book consists of eleven parts?each part containing a series of focused lectures and ending with bibliographic comments, problems, and computer projects with MATLAB solutions.

Model Predictive Control in the Process Industry

Since its origins in the 1940s, the subject of decision making under uncertainty has grown into a diversified area with application in several branches of engineering and in those areas of the social sciences concerned with policy analysis and prescription. These approaches required a computing capacity too expensive for the time, until the ability to collect and process huge quantities of data engendered an explosion of work in the area. This book provides succinct and rigorous treatment of the foundations of stochastic control; a unified approach to filtering, estimation, prediction, and stochastic and adaptive control; and the conceptual framework necessary to understand current trends in stochastic control, data mining, machine learning, and robotics.

Multivariable System Identification For Process Control

"This publication presents a series of practical applications of different Soft Computing techniques to real-world problems, showing the enormous potential of these techniques in solving problems"--Provided by publisher.

Applied and Computational Control, Signals, and Circuits

The field of Digital Signal Processing has developed so fast in the last two decades that it can be found in the graduate and undergraduate programs of most universities. This development is related to the growing available techno logies for implementing digital signal processing algorithms. The tremendous growth of development in the digital signal processing area has turned some of its specialized areas into fields themselves. If accurate information of the signals to be processed is available, the designer can easily choose the most appropriate algorithm to process the signal. When dealing with signals whose statistical properties are unknown, fixed algorithms do not process these signals efficiently. The solution is to use an adaptive filter that automatically changes its characteristics by optimizing the internal parameters. The adaptive filtering algorithms are essential in many statistical signal processing applications. Although the field of adaptive signal processing has been subject of research for over three decades, it was in the eighties that a major growth occurred in research and applications. Two main reasons can be credited to this growth, the availability of implementation tools and the appearance of early textbooks exposing the subject in an organized form. Presently, there is still a lot of activities going on in the area of adaptive filtering. In spite of that, the theor etical development in the linear-adaptive-filtering area reached a maturity that justifies a text treating the various methods in a unified way, emphasizing the algorithms that work well in practical implementation.

Errors-in-Variables Methods in System Identification

System Identification

Identification of Continuous-time Models from Sampled Data

This reference book can be read at different levels, making it a powerful source of information. It presents most of the aspects of control that can help anyone to have a synthetic view of control theory and possible applications, especially concerning process engineering.