Nonlinear Observers And Applications 1st Edition

Nonlinear FilteringFault Detection and Diagnosis in Nonlinear SystemsNonlinear and Adaptive Control with ApplicationsDesign and Performance Tradeoffs of High-gain Observers with Applications to the Control of Smart Material Actuated SystemsControl Applications in Marine Systems 1998Advances and Applications in Nonlinear Control SystemsSystem Identification 2003Vibration Control and Actuation of Large-Scale SystemsContinuous Time Dynamical SystemsNonlinear Model Predictive ControlAdvances in Discrete-Time Sliding Mode ControlSliding Mode Control and ObservationSelected Topics in Dynamics and Control of Chemical and Biological ProcessesNonlinear SystemsMultisensor Attitude EstimationFeedback SystemsObservers for Nonlinear Systems, with Application to Active Automotive SuspensionsNonlinear Control Systems using MATLAB®Process ControlStochastic Game Strategies and their ApplicationsAerospace Applications of Magnetic Suspension Technology, Part 1New Directions in Nonlinear Observer DesignObservers in Control SystemsNew Trends in Observer-based ControlNonlinear Control SystemsApplication of Closed Loop Non-linear Observers for Position Detection on Induction Motors Using the Induced Spatial Harmonic Emf in the Machine Voltages and CurrentsThe Koopman Operator in Systems and ControlDisturbance Observer-Based ControlRobotic Systems for Handling and AssemblyNonlinear FilteringControl and Observer Design for Nonlinear Finite and Infinite Dimensional SystemsStability and Control of Nonlinear Time-varying

SystemsNonlinear ControlNonlinear Kalman Filter for Multi-Sensor Navigation of Unmanned Aerial VehicleChaos in Automatic ControlNonlinear Observers and ApplicationsHandbook of Marine Craft Hydrodynamics and Motion ControlRobust Observer-Based Fault Diagnosis for Nonlinear Systems Using MATLAB®AC Electric Motors ControlNonlinear Control Systems Design 1989

Nonlinear Filtering

This volume presents a well balanced combination of state-of-the-art theoretical results in the field of nonlinear controller and observer design, combined with industrial applications stemming from mechatronics, electrical, (bio–) chemical engineering, and fluid dynamics. The unique combination of results of finite as well as infinite–dimensional systems makes this book a remarkable contribution addressing postgraduates, researchers, and engineers both at universities and in industry. The contributions to this book were presented at the Symposium on Nonlinear Control and Observer Design: From Theory to Applications (SYNCOD), held September 15–16, 2005, at the University of Stuttgart, Germany. The conference and this book are dedicated to the 65th birthday of Prof. Dr.–Ing. Dr.h.c. Michael Zeitz to honor his life – long research and contributions on the fields of nonlinear control and observer design.

Fault Detection and Diagnosis in Nonlinear Systems

Provides complete coverage of both the Lyapunov and Input-Output stability theories, ina readable, concise manner. * Supplies an introduction to the popular backstepping approach to nonlinear control design * Gives a thorough discussion of the concept of input-to-state stability * Includes a discussion of the fundamentals of feedback linearization and related results. * Details complete coverage of the fundamentals of dissipative system's theory and its application in the so-called L2gain control prooblem, for the first time in an introductory level textbook. * Contains a thorough discussion of nonlinear observers, a very important problem, not commonly encountered in textbooksat this level. *An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

Nonlinear and Adaptive Control with Applications

Although parallel robots are known to offer many advantages with respect to accuracy, dynamics, and stiffness, major breakthroughs in industrial applications have not yet taken place. This is due to a knowledge gap preventing fast and precise execution of industrial handling and assembly tasks. This book focuses on the design, modeling, and control of innovative parallel structures as well as the

integration of novel machine elements. Special attention is paid to the integration of active components into lightweight links and passive joints. In addition, new control concepts are introduced to minimize structural vibrations. Although the optimization of robot systems itself allows a reduction of cycle times, these can be further decreased by improved path planning, robot programming, and automated assembly planning concepts described by 25 contributions within this book. The content of this volume is subdivided into four main parts dealing with Modeling and Design, System Implementation, Control and Programming as well as Adaptronics and Components. This book is aimed at researchers and postgraduates working in the field of parallel robots as well as practicing engineers dealing with industrial robot development and robotic applications.

Design and Performance Tradeoffs of High-gain Observers with Applications to the Control of Smart Material Actuated Systems

For a first course on nonlinear control that can be taught in one semester This book emerges from the award-winning book, Nonlinear Systems, but has a distinctly different mission and organization. While Nonlinear Systems was intended as a reference and a text on nonlinear system analysis and its application to control, this streamlined book is intended as a text for a first course on nonlinear control. In Nonlinear Control, author Hassan K. Khalil employs a writing style that is intended

to make the book accessible to a wider audience without compromising the rigor of the presentation. Teaching and Learning Experience This program will provide a better teaching and learning experience-for you and your students. It will help: *Provide an Accessible Approach to Nonlinear Control: This streamlined book is intended as a text for a first course on nonlinear control that can be taught in one semester. *Support Learning: Over 250 end-of-chapter exercises give students plenty of opportunities to put theory into action.

Control Applications in Marine Systems 1998

In the last two decades, the development of specific methodologies for the control of systems described by nonlinear mathematical models has attracted an ever increasing interest. New breakthroughs have occurred which have aided the design of nonlinear control systems. However there are still limitations which must be understood, some of which were addressed at the IFAC Symposium in Capri. The emphasis was on the methodological developments, although a number of the papers were concerned with the presentation of applications of nonlinear design philosophies to actual control problems in chemical, electrical and mechanical engineering.

Advances and Applications in Nonlinear Control Systems

Nonlinear Filtering covers linear and nonlinear filtering in a comprehensive manner, with appropriate theoretic and practical development. Aspects of modeling, estimation, recursive filtering, linear filtering, and nonlinear filtering are presented with appropriate and sufficient mathematics. A modeling-control-system approach is used when applicable, and detailed practical applications are presented to elucidate the analysis and filtering concepts. MATLAB routines are included, and examples from a wide range of engineering applications - including aerospace, automated manufacturing, robotics, and advanced control systems - are referenced throughout the text.

System Identification 2003

This book presents both basic and advanced concepts and techniques for the monitoring and control of chemical and biochemical processes. It also covers aspects of the implementation of these different robust techniques. The book offers a balanced view of the theoretical and practical issues of control systems and provides different cases to illustrate the controller and observer design procedures and their dynamic effects in the closed-loop.

Vibration Control and Actuation of Large-Scale Systems

Continuous Time Dynamical Systems

Optimal control deals with the problem of finding a control law for a given system such that a certain optimality criterion is achieved. An optimal control is a set of differential equations describing the paths of the control variables that minimize the cost functional. This book, Continuous Time Dynamical Systems: State Estimation and Optimal Control with Orthogonal Functions, considers different classes of systems with quadratic performance criteria. It then attempts to find the optimal control law for each class of systems using orthogonal functions that can optimize the given performance criteria. Illustrated throughout with detailed examples, the book covers topics including: Block-pulse functions and shifted Legendre polynomials State estimation of linear time-invariant systems Linear optimal control systems incorporating observers Optimal control of systems described by integro-differential equations Linear-quadratic-Gaussian control Optimal control of singular systems Optimal control of time-delay systems with and without reverse time terms Optimal control of second-order nonlinear systems Hierarchical control of linear time-invariant and time-varying systems

Nonlinear Model Predictive Control

Vibration Control and Actuation of Large-Scale Systems gives a systematically and

self-contained description of the many facets of envisaging, designing, implementing, or experimentally exploring advanced vibration control systems. The book is devoted to the development of mathematical methodologies for vibration analysis and control problems of large-scale systems, including structural dynamics, vehicle dynamics and wind turbines, for example. The research problems addressed in each chapter are well motivated, with numerical and simulation results given in each chapter that reflect best engineering practice. Provides a series of the latest results in vibration control, structural control, actuation, component failures, and more Gives numerical and simulation results to reflect best engineering practice Presents recent advances of theory, technological aspects, and applications of advanced control methodologies in vibration control

Advances in Discrete-Time Sliding Mode Control

The purpose of this fantastically useful book is to lay out an overview on possible tools for state reconstruction in nonlinear systems. Here, basic observability notions and observer structures are recalled, together with ingredients for advanced designs on this basis. The problem of state reconstruction in dynamical systems, known as observer problem, is crucial for controlling or even merely monitoring processes. For linear systems, the theory has been well established for several years, so this book attempts to tackle the problem for non-linear systems.

Sliding Mode Control and Observation

The technology of hydrodynamic modeling and marine craft motion control systems has progressed greatly in recent years. This timely survey includes the latest tools for analysis and design of advanced guidance, navigation and control systems and presents new material on underwater vehicles and surface vessels. Each section presents numerous case studies and applications, providing a practical understanding of how model-based motion control systems are designed. Key features include: a three-part structure covering Modeling of Marine Craft; Guidance, Navigation and Control Systems; and Appendices, providing all the supporting theory in a single resource kinematics, kinetics, hydrostatics, seakeeping and maneuvering theory, and simulation models for marine craft and environmental forces guidance systems, sensor fusion and integrated navigation systems, inertial measurement units, Kalman filtering and nonlinear observer design for marine craft state-of-the-art methods for feedback control more advanced methods using nonlinear theory, enabling the user to compare linear design techniques before a final implementation is made. linear and nonlinear stability theory, and numerical methods companion website that hosts links to lecture notes and download information for the Marine Systems Simulator (MSS) which is an open source Matlab/Simulink® toolbox for marine systems. The MSS toolbox includes hydrodynamic models and motion control systems for ships, underwater vehicles and floating structures With an appropriate balance between

mathematical theory and practical applications, academic and industrial researchers working in marine and control engineering aspects of manned and unmanned maritime vehicles will benefit from this comprehensive handbook. It is also suitable for final year undergraduates and postgraduates, lecturers, development officers, and practitioners in the areas of rigid-body modeling, hydrodynamics, simulation of marine craft, control and estimation theory, decision-support systems and sensor fusion. www.wiley.com/go/fossen_marine

Selected Topics in Dynamics and Control of Chemical and Biological Processes

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.

Nonlinear Systems

The authors here provide a detailed treatment of the design of robust adaptive controllers for nonlinear systems with uncertainties. They employ a new tool based on the ideas of system immersion and manifold invariance. New algorithms are

delivered for the construction of robust asymptotically-stabilizing and adaptive control laws for nonlinear systems. The methods proposed lead to modular schemes that are easier to tune than their counterparts obtained from Lyapunov redesign.

Multisensor Attitude Estimation

The development of computer software for nonlinear control systems has provided many benefits for teaching, research, and the development of control systems design. MATLAB is considered the dominant software platforms for linear and nonlinear control systems analysis. This book provides an easy way to learn nonlinear control systems such as feedback linearization technique and Sliding mode control (Structure variable control) which are one of the most used techniques in nonlinear control dynamical systems; therefore teachers-students and researchers are all in need to handle such techniques; and since they are too difficult for them to handle such nonlinear controllers especially for a more complicated systems such as induction motor, satellite, and vehicles dynamical models. Thus, this document it is an excellent resource for learning the principle of feedback linearization and sliding mode techniques in an easy and simple way: Provides a briefs description of the feedback linearization and sliding mode control strategies Includes a simple method on how to determine the right and appropriate controller (P-PI-PID) for feedback linearization control strategy. A Symbolic MATLAB

Based function for finding the feedback linearization and sliding mode controllers are developed and tested using several examples. A simple method for finding the approximate sliding mode controller parameters is introduced Where the program used to construct the nonlinear controller uses symbolic computations; such that the user should provide the program with the necessary functions f(x), g(x) and h(x) using the symbolic library.

Feedback Systems

Game theory involves multi-person decision making and differential dynamic game theory has been widely applied to n-person decision making problems, which are stimulated by a vast number of applications. This book addresses the gap to discuss general stochastic n-person noncooperative and cooperative game theory with wide applications to control systems, signal processing systems, communication systems, managements, financial systems, and biological systems. H∞ game strategy, n-person cooperative and noncooperative game strategy are discussed for linear and nonlinear stochastic systems along with some computational algorithms developed to efficiently solve these game strategies.

Observers for Nonlinear Systems, with Application to Active Automotive Suspensions

The scope of the Workshop was Challenge to New Cyberships. When designing a marine system it is important that the cybernetic control system is seaworthy, safe, robust, intelligent and adaptive to strong sea disturbances and its changes. The Workshop was a forum for discussing the latest achievements and trends within the following fields: Marine Control Systems; Ship Manoeuvring Model; Navigation Systems; Traffic Guidance and Control Systems; Main Engine and Machinery Control Systems; Safety and Fault Control Systems; Machinery Surveillance, Condition Monitoring and Quality Control Systems; Training and Vehicle Simulation Systems.

Nonlinear Control Systems using MATLAB®

Process Control

The sliding mode control methodology has proven effective in dealing with complex dynamical systems affected by disturbances, uncertainties and unmodeled dynamics. Robust control technology based on this methodology has been applied to many real-world problems, especially in the areas of aerospace control, electric power systems, electromechanical systems, and robotics. Sliding Mode Control and Observation represents the first textbook that starts with

classical sliding mode control techniques and progresses toward newly developed higher-order sliding mode control and observation algorithms and their applications. The present volume addresses a range of sliding mode control issues, including: *Conventional sliding mode controller and observer design *Second-order sliding mode controllers and differentiators *Frequency domain analysis of conventional and second-order sliding mode controllers *Higher-order sliding mode controllers and differentiators *Higher-order sliding mode observers *Sliding mode disturbance observer based control *Numerous applications, including reusable launch vehicle and satellite formation control, blood glucose regulation, and car steering control are used as case studies Sliding Mode Control and Observation is aimed at graduate students with a basic knowledge of classical control theory and some knowledge of state-space methods and nonlinear systems, while being of interest to a wider audience of graduate students in electrical/mechanical/aerospace engineering and applied mathematics, as well as researchers in electrical, computer, chemical, civil, mechanical, aeronautical, and industrial engineering, applied mathematicians, control engineers, and physicists. Sliding Mode Control and Observation provides the necessary tools for graduate students, researchers and engineers to robustly control complex and uncertain nonlinear dynamical systems. Exercises provided at the end of each chapter make this an ideal text for an advanced course taught in control theory.

Stochastic Game Strategies and their Applications

Over the past few years significant progress has been achieved in the field of nonlinear model predictive control (NMPC), also referred to as receding horizon control or moving horizon control. More than 250 papers have been published in 2006 in ISI Journals. With this book we want to bring together the contributions of a diverse group of internationally well recognized researchers and industrial practitioners, to critically assess the current status of the NMPC field and to discuss future directions and needs. The book consists of selected papers presented at the International Workshop on Assessment an Future Directions of Nonlinear Model Predictive Control that took place from September 5 to 9, 2008, in Pavia, Italy.

Aerospace Applications of Magnetic Suspension Technology, Part 1

The scope of the symposium covers all major aspects of system identification, experimental modelling, signal processing and adaptive control, ranging from theoretical, methodological and scientific developments to a large variety of (engineering) application areas. It is the intention of the organizers to promote SYSID 2003 as a meeting place where scientists and engineers from several research communities can meet to discuss issues related to these areas. Relevant topics for the symposium program include: Identification of linear and multivariable systems, identification of nonlinear systems, including neural networks,

identification of hybrid and distributed systems, Identification for control, experimental modelling in process control, vibration and modal analysis, model validation, monitoring and fault detection, signal processing and communication, parameter estimation and inverse modelling, statistical analysis and uncertainty bounding, adaptive control and data-based controller tuning, learning, data mining and Bayesian approaches, sequential Monte Carlo methods, including particle filtering, applications in process control systems, motion control systems, robotics, aerospace systems, bioengineering and medical systems, physical measurement systems, automotive systems, econometrics, transportation and communication systems *Provides the latest research on System Identification *Contains contributions written by experts in the field *Part of the IFAC Proceedings Series which provides a comprehensive overview of the major topics in control engineering.

New Directions in Nonlinear Observer Design

This book provides an introduction to the mathematics needed to model, analyze, and design feedback systems. It is an ideal textbook for undergraduate and graduate students, and is indispensable for researchers seeking a self-contained reference on control theory. Unlike most books on the subject, Feedback Systems develops transfer functions through the exponential response of a system, and is accessible across a range of disciplines that utilize feedback in physical, biological,

information, and economic systems. Karl Åström and Richard Murray use techniques from physics, computer science, and operations research to introduce control-oriented modeling. They begin with state space tools for analysis and design, including stability of solutions, Lyapunov functions, reachability, state feedback observability, and estimators. The matrix exponential plays a central role in the analysis of linear control systems, allowing a concise development of many of the key concepts for this class of models. Åström and Murray then develop and explain tools in the frequency domain, including transfer functions, Nyquist analysis, PID control, frequency domain design, and robustness. They provide exercises at the end of every chapter, and an accompanying electronic solutions manual is available. Feedback Systems is a complete one-volume resource for students and researchers in mathematics, engineering, and the sciences. Covers the mathematics needed to model, analyze, and design feedback systems Serves as an introductory textbook for students and a self-contained resource for researchers Includes exercises at the end of every chapter Features an electronic solutions manual Offers techniques applicable across a range of disciplines

Observers in Control Systems

This book presents special systems derived from industrial models, including the complex saturation nonlinear functions and the delay nonlinear functions. It also presents typical methods, such as the classical Liapunov and Integral Inequalities

methods. Providing constructive qualitative and stability conditions for linear systems with saturated inputs in both global and local contexts, it offers practitioners more concise model systems for modern saturation nonlinear techniques, which have the potential for future applications. This book is a valuable guide for researchers and graduate students in the fields of mathematics, control, and engineering.

New Trends in Observer-based Control

The complexity of AC motor control lies in the multivariable and nonlinear nature of AC machine dynamics. Recent advancements in control theory now make it possible to deal with long-standing problems in AC motors control. This text expertly draws on these developments to apply a wide range of model-based control designmethods to a variety of AC motors. Contributions from over thirty top researchers explain how modern control design methods can be used to achieve tight speed regulation, optimal energetic efficiency, and operation reliability and safety, by considering online state variable estimation in the absence of mechanical sensors, power factor correction, machine flux optimization, fault detection and isolation, and fault tolerant control. Describing the complete control approach, both controller and observer designs are demonstrated using advanced nonlinear methods, stability and performance are analysed using powerful techniques, including implementation considerations using digital computing

means. Other key features: • Covers the main types of AC motors including triphase, multiphase, and doubly fed induction motors, wound rotor, permanent magnet, and interior PM synchronous motors • Illustrates the usefulness of the advanced control methods via industrial applications including electric vehicles, high speed trains, steel mills, and more • Includes special focus on sensorless nonlinear observers, adaptive and robust nonlinear controllers, output-feedback controllers, fault detection and isolation algorithms, and fault tolerant controllers This comprehensive volume provides researchers and designers and R&D engineers with a single-source reference on AC motor system drives in the automotive and transportation industry. It will also appeal to advanced students in automatic control, electrical, power systems, mechanical engineering and robotics, as well as mechatronic, process, and applied control system engineers.

Nonlinear Control Systems

Observers are digital algorithms that combine sensor outputs with knowledge of the system to provide results superior to traditional structures, which rely wholly on sensors. Observers have been used in selected industries for years, but most books explain them with complex mathematics. Observers in Control Systems uses intuitive discussion, software experiments, and supporting analysis to explain the advantages and disadvantages of observers. If you are working in controls and want to improve your control systems, observers could be the technology you need

and this book will give you a clear, thorough explanation of how they work and how to use them. Control systems and devices have become the most essential part of nearly all mechanical systems, machines, devices and manufacturing systems throughout the world. Increasingly the efficiency of production, the reliability of output and increased energy savings are a direct result of the quality and deployment of the control system. A modern and essential tool within the engineer's kit is the Observer which helps improve the performance and reduce the cost of these systems. George Ellis is the author of the highly successful Control System Design Guide (Second Edition). Unlike most controls books, which are written by control theorists and academics, Ellis is a leading engineer, designer, author and lecturer working in industry directly with the users of industrial motion control systems. Observers in Control Systems is written for all professional engineers and is designed to be utilized without an in-depth background in control theory. This is a "real-world" book which will demonstrate how observers work and how they can improve your control system. It also shows how observers operate when conditions are not ideal and teaches the reader how to quickly tune an observer in a working system. Software Available online: A free updated and enhanced version of the author's popular Visual ModelQ allows the reader to practice the concepts with Visual ModelQ models on a PC. Based on a virtual laboratory, all key topics are demonstrated with more than twenty control system models. The models are written in Visual ModelQ ,and are available on the Internet to every reader with a PC. Teaches observers and Kalman filters from an

intuitive perspective Explains how to reduce control system susceptibility to noise Shows how to design an adaptive controller based on estimating parameter variation using observers Shows how to improve a control system's ability to reject disturbances Key topics are demonstrated with PC-based models of control systems. The models are written in both MatLab® and ModelQ; models are available free of charge

Application of Closed Loop Non-linear Observers for Position Detection on Induction Motors Using the Induced Spatial Harmonic Emf in the Machine Voltages and Currents

Chaotic behavior arises in a variety of control settings. In some cases, it is beneficial to remove this behavior; in others, introducing or taking advantage of the existing chaotic components can be useful for example in cryptography. Chaos in Automatic Control surveys the latest methods for inserting, taking advantage of, or removing chaos in a variety of applications. This book supplies the theoretical and pedagogical basis of chaos in control systems along with new concepts and recent developments in the field. Presented in three parts, the book examines open-loop analysis, closed-loop control, and applications of chaos in control systems. The first section builds a background in the mathematics of ordinary differential and difference equations on which the remainder of the book is based.

It includes an introductory chapter by Christian Mira, a pioneer in chaos research. The next section explores solutions to problems arising in observation and control of closed-loop chaotic control systems. These include model-independent control methods, strategies such as H-infinity and sliding modes, polytopic observers, normal forms using homogeneous transformations, and observability normal forms. The final section explores applications in wireless transmission, optics, power electronics, and cryptography. Chaos in Automatic Control distills the latest thinking in chaos while relating it to the most recent developments and applications in control. It serves as a platform for developing more robust, autonomous, intelligent, and adaptive systems.

The Koopman Operator in Systems and Control

Disturbance Observer-Based Control

The book reports on the latest advances and applications of nonlinear control systems. It consists of 30 contributed chapters by subject experts who are specialized in the various topics addressed in this book. The special chapters have been brought out in the broad areas of nonlinear control systems such as robotics, nonlinear circuits, power systems, memristors, underwater vehicles, chemical

processes, observer design, output regulation, backstepping control, sliding mode control, time-delayed control, variables structure control, robust adaptive control, fuzzy logic control, chaos, hyperchaos, jerk systems, hyperjerk systems, chaos control, chaos synchronization, etc. Special importance was given to chapters offering practical solutions, modeling and novel control methods for the recent research problems in nonlinear control systems. This book will serve as a reference book for graduate students and researchers with a basic knowledge of electrical and control systems engineering. The resulting design procedures on the nonlinear control systems are emphasized using MATLAB software.

Robotic Systems for Handling and Assembly

The past decade has witnessed an increasing interest in observers for nonlinear systems. This subject is relevant in different contexts such as synchronization of complex dynamical systems, fault detection and isolation, and output feedback control. This book contains the contributions that are to be presented at the workshop "New Directions in Nonlinear Observer Design", to be held from June 24-26, 1999, in Geiranger Fjord, Norway. The workshop has been organised by Olav Egeland, Thor I. Fossen and Henk Nijmeijer; it will include participants from Africa, Asia, Europe and USA and it will focus on recent developments in the above mentioned areas. The contributions form a good review of present achievements and challenges in nonlinear observer design. The workshop is supported by the

Strategic University Program on Marine Cybernetics at the Norwegian University of Science and Technology and ABB.

Nonlinear Filtering

Due to its abilities to compensate disturbances and uncertainties, disturbance observer based control (DOBC) is regarded as one of the most promising approaches for disturbance-attenuation. One of the first books on DOBC, Disturbance Observer Based Control: Methods and Applications presents novel theory results as well as best practices for applica

Control and Observer Design for Nonlinear Finite and Infinite Dimensional Systems

This book introduces several observer-based methods, including: • the sliding-mode observer • the adaptive observer • the unknown-input observer and • the descriptor observer method for the problem of fault detection, isolation and estimation, allowing readers to compare and contrast the different approaches. The authors present basic material on Lyapunov stability theory, H¥ control theory, sliding-mode control theory and linear matrix inequality problems in a self-contained and step-by-step manner. Detailed and rigorous mathematical proofs

are provided for all the results developed in the text so that readers can quickly gain a good understanding of the material. MATLAB® and Simulink® codes for all the examples, which can be downloaded from http://extras.springer.com, enable students to follow the methods and illustrative examples easily. The systems used in the examples make the book highly relevant to real-world problems in industrial control engineering and include a seventh-order aircraft model, a single-link flexible joint robot arm and a satellite controller. To help readers quickly find the information they need and to improve readability, the individual chapters are written so as to be semi-independent of each other. Robust Oberserver-Based Fault Diagnosis for Nonlinear Systems Using MATLAB® is of interest to process, aerospace, robotics and control engineers, engineering students and researchers with a control engineering background.

Stability and Control of Nonlinear Time-varying Systems

The high reliability required in industrial processes has created the necessity of detecting abnormal conditions, called faults, while processes are operating. The term fault generically refers to any type of process degradation, or degradation in equipment performance because of changes in the process's physical characteristics, process inputs or environmental conditions. This book is about the fundamentals of fault detection and diagnosis in a variety of nonlinear systems which are represented by ordinary differential equations. The fault detection

problem is approached from a differential algebraic viewpoint, using residual generators based upon high-gain nonlinear auxiliary systems ('observers'). A prominent role is played by the type of mathematical tools that will be used, requiring knowledge of differential algebra and differential equations. Specific theorems tailored to the needs of the problem-solving procedures are developed and proved. Applications to real-world problems, both with constant and time-varying faults, are made throughout the book and include electromechanical positioning systems, the Continuous Stirred Tank Reactor (CSTR), bioreactor models and belt drive systems, to name but a few.

Nonlinear Control

New Trends in Observer-Based Control: A Practical Guide to Process and Engineering Applications presents a concise introduction to the latest advances in observer-based control design. The book gives a comprehensive tutorial on new trends in the design of observer-based controllers for which the separation principle is well established. It covers a wide range of applications, also including worked examples that make it ideal for both advanced courses and researchers starting work in the field. This book is also particularly suitable for engineers who want to quickly and efficiently enter the field. Presents a clear-and-concise introduction to the latest advances in observer-based control design Offers content on many facets of observer-based control design Discusses key applications in the

fields of power systems, robotics and mechatronics, flight and automotive systems

Nonlinear Kalman Filter for Multi-Sensor Navigation of Unmanned Aerial Vehicle

Chaos in Automatic Control

This book provides a broad overview of state-of-the-art research at the intersection of the Koopman operator theory and control theory. It also reviews novel theoretical results obtained and efficient numerical methods developed within the framework of Koopman operator theory. The contributions discuss the latest findings and techniques in several areas of control theory, including model predictive control, optimal control, observer design, systems identification and structural analysis of controlled systems, addressing both theoretical and numerical aspects and presenting open research directions, as well as detailed numerical schemes and data-driven methods. Each contribution addresses a specific problem. After a brief introduction of the Koopman operator framework, including basic notions and definitions, the book explores numerical methods, such as the dynamic mode decomposition (DMD) algorithm and Arnoldi-based methods, which are used to represent the operator in a finite-dimensional basis and to

compute its spectral properties from data. The main body of the book is divided into three parts: theoretical results and numerical techniques for observer design, synthesis analysis, stability analysis, parameter estimation, and identification; data-driven techniques based on DMD, which extract the spectral properties of the Koopman operator from data for the structural analysis of controlled systems; and Koopman operator techniques with specific applications in systems and control, which range from heat transfer analysis to robot control. A useful reference resource on the Koopman operator theory for control theorists and practitioners, the book is also of interest to graduate students, researchers, and engineers looking for an introduction to a novel and comprehensive approach to systems and control, from pure theory to data-driven methods.

Nonlinear Observers and Applications

Nonlinear Systems is divided into three volumes. The first deals with modeling and estimation, the second with stability and stabilization and the third with control. This three-volume set provides the most comprehensive and detailed reference available on nonlinear systems. Written by a group of leading experts in the field, drawn from industry, government and academic institutions, it provides a solid theoretical basis on nonlinear control methods as well as practical examples and advice for engineers, teachers and researchers working with nonlinear systems. Each book focuses on the applicability of the concepts introduced and keeps the

level of mathematics to a minimum. Simulations and industrial examples drawn from aerospace as well as mechanical, electrical and chemical engineering are given throughout.

Handbook of Marine Craft Hydrodynamics and Motion Control

Nonlinear Kalman Filter for Multi-Sensor Navigation of Unmanned Aerial Vehicle covers state estimation development approaches for Mini-UAV. The book focuses on Kalman filtering technics for UAV design, proposing a new design methodology and case study related to inertial navigation systems for drones. Both simulation and real experiment results are presented, thus showing new and promising perspectives. Gives a state estimation development approach for mini-UAVs Explains Kalman filtering techniques Introduce a new design method for unmanned aerial vehicles Introduce cases relating to the inertial navigation system of drones

Robust Observer-Based Fault Diagnosis for Nonlinear Systems Using MATLAB®

The focus of this book is on the design of a specific control strategy using digital computers. This control strategy referred to as Sliding Mode Control (SMC), has its roots in (continuous-time) relay control. This book aims to explain recent

investigations' output in the field of discrete-time sliding mode control (DSMC). The book starts by explaining a new robust LMI-based (state-feedback and observer-based output-feedback) DSMC including a new scheme for sparsely distributed control. It includes a novel event-driven control mechanism, called actuator-based event-driven scheme, using a synchronized-rate biofeedback system for heart rate regulation during cycle-ergometer. Key Features: Focuses on LMI-based SMC (sliding mode control) for uncertain discrete-time system using novel nonlinear components in the control law Makes reader understand the techniques of designing a discrete controller based on the flexible sliding functions Proposes new algorithms for sparsifying control and observer network through multi-objective optimization frameworks Discusses a framework for the design of SMC for two-dimensional systems along with analyzing the controllability of two-dimensional systems Discusses novel schemes for sparsifying the control network

AC Electric Motors Control

There has been an increasing interest in multi-disciplinary research on multisensor attitude estimation technology driven by its versatility and diverse areas of application, such as sensor networks, robotics, navigation, video, biomedicine, etc. Attitude estimation consists of the determination of rigid bodies' orientation in 3D space. This research area is a multilevel, multifaceted process handling the automatic association, correlation, estimation, and combination of data and

information from several sources. Data fusion for attitude estimation is motivated by several issues and problems, such as data imperfection, data multi-modality, data dimensionality, processing framework, etc. While many of these problems have been identified and heavily investigated, no single data fusion algorithm is capable of addressing all the aforementioned challenges. The variety of methods in the literature focus on a subset of these issues to solve, which would be determined based on the application in hand. Historically, the problem of attitude estimation has been introduced by Grace Wahba in 1965 within the estimate of satellite attitude and aerospace applications. This book intends to provide the reader with both a generic and comprehensive view of contemporary data fusion methodologies for attitude estimation, as well as the most recent researches and novel advances on multisensor attitude estimation task. It explores the design of algorithms and architectures, benefits, and challenging aspects, as well as a broad array of disciplines, including: navigation, robotics, biomedicine, motion analysis, etc. A number of issues that make data fusion for attitude estimation a challenging task, and which will be discussed through the different chapters of the book, are related to: 1) The nature of sensors and information sources (accelerometer, gyroscope, magnetometer, GPS, inclinometer, etc.); 2) The computational ability at the sensors; 3) The theoretical developments and convergence proofs; 4) The system architecture, computational resources, fusion level.

Nonlinear Control Systems Design 1989

Nonlinear Filtering covers linear and nonlinear filtering in a comprehensive manner, with appropriate theoretic and practical development. Aspects of modeling, estimation, recursive filtering, linear filtering, and nonlinear filtering are presented with appropriate and sufficient mathematics. A modeling-control-system approach is used when applicable, and detailed practical applications are presented to elucidate the analysis and filtering concepts. MATLAB routines are included, and examples from a wide range of engineering applications - including aerospace, automated manufacturing, robotics, and advanced control systems - are referenced throughout the text.

ROMANCE ACTION & ADVENTURE MYSTERY & THRILLER BIOGRAPHIES & HISTORY CHILDREN'S YOUNG ADULT FANTASY HISTORICAL FICTION HORROR LITERARY FICTION NON-FICTION SCIENCE FICTION