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Linear Optimal Control Systems-Huibert Kwakernaak 1969

Optimal Control Systems-D. Subbaram Naidu 2018-10-03

The theory of optimal control systems has grown and flourished since the 1960's. Many texts, written on varying levels of sophistication, have been published on the subject. Yet even those purportedly designed for beginners in the field are often riddled with complex theorems, and many treatments fail to include topics that are essential to a thorough grounding in the various aspects of and approaches to optimal control. Optimal Control Systems provides a comprehensive but accessible treatment of the subject with just the right degree of mathematical rigor to be complete but practical. It provides a solid bridge between "traditional" optimization using the calculus of variations and what is called "modern" optimal control. It also treats both continuous-time and discrete-time optimal control systems, giving students a firm grasp on both methods. Among this book's most outstanding features is a summary table that accompanies each topic or problem and includes a statement of the problem with a step-by-step solution. Students will also gain valuable experience in using industry-standard MATLAB and SIMULINK software, including the Control System and Symbolic Math Toolboxes. Diverse applications across fields from power engineering to medicine make a foundation in optimal control systems an essential part of an engineer's background. This clear, streamlined presentation is ideal for a graduate level course on control systems and as a quick reference for working engineers.

Linear Optimal Control Systems-Huibert Kwakernaak 1972-11-10

"This book attempts to reconcile modern linear control theory with classical control theory. One of the major concerns of this text is to present design methods, employing modern techniques, for obtaining control systems that stand up to the requirements that have been so well developed in the classical expositions of control theory. Therefore, among other things, an entire chapter is devoted to a description of the analysis of control systems, mostly following the classical lines of thought. In the later chapters of the book, in which modern synthesis methods are developed, the chapter on analysis is recurrently referred to. Furthermore, special attention is paid to subjects that are standard in classical control theory but are frequently overlooked in modern treatments, such as nonzero set point control systems, tracking systems, and control systems that have to cope with constant disturbances. Also, heavy emphasis is placed upon the stochastic nature of control problems because the stochastic aspects are so essential." --Preface.

Constrained Optimal Control of Linear and Hybrid Systems-Francesco Borrelli 2003-09-04

Many practical control problems are dominated by characteristics such as state, input and operational constraints, alternations between different operating regimes, and the interaction of continuous-time and discrete event systems. At present no methodology is available to design controllers in a systematic manner for such systems. This book introduces a new design theory for controllers for such constrained and switching dynamical systems and leads to algorithms that systematically solve control synthesis problems. The first part is a self-contained introduction to multiparametric programming, which is the main technique used to study and compute state feedback optimal control laws. The book's main objective is to derive properties of the state feedback solution, as well as to obtain algorithms to compute it efficiently. The focus is on constrained linear systems and constrained linear hybrid systems. The applicability of the theory is demonstrated through two experimental case studies: a mechanical laboratory process and a traction control system developed jointly with the Ford Motor Company in Michigan.

Optimal Control Methods for Linear Discrete-Time Economic Systems-Y. Murata 2012-12-06

As our title reveals, we focus on optimal control methods and applications relevant to linear dynamic economic systems in discrete-time variables. We deal only with discrete cases simply because economic data are available in discrete forms, hence realistic economic policies should be established in discrete-time structures. Though many books have been written on optimal control in engineering, we see few on discrete-type optimal control. More over, since economic models take slightly different forms than do engineer ing ones, we need a comprehensive, self-contained treatment of linear optimal control applicable to discrete-time economic systems. The present work is intended to fill this need from the standpoint of contemporary macroeconomic stabilization. The work is organized as follows. In Chapter 1 we demonstrate instru ment instability in an economic stabilization problem and thereby establish the motivation for our departure into the optimal control world. Chapter 2 provides fundamental concepts and propositions for controlling linear deterministic discrete-time systems, together with some economic applica tions and numerical methods. Our optimal control rules are in the form of feedback from known state variables of the preceding period. When state variables are not observable or are accessible only with observation errors, we must obtain appropriate proxies for these variables, which are called "observers" in deterministic cases or "filters" in stochastic circumstances. In Chapters 3 and 4, respectively, Luenberger observers and Kalman filters are discussed, developed, and applied in various directions. Noticing that a separation principle lies between observer (or filter) and controller (cf.

The Zeros of Linear Optimal Control Systems and Their Role in High Feedback Gain Stability Design-Uri Shaked 1976

Optimal Control Systems-D. Subbaram Naidu 2018-10-03

The theory of optimal control systems has grown and flourished since the 1960's. Many texts, written on varying levels of sophistication, have been published on the subject. Yet even those purportedly designed for beginners in the field are often riddled with complex theorems, and many treatments fail to include topics that are essential to a thorough grounding in the various aspects of and approaches to

optimal control. Optimal Control Systems provides a comprehensive but accessible treatment of the subject with just the right degree of mathematical rigor to be complete but practical. It provides a solid bridge between "traditional" optimization using the calculus of variations and what is called "modern" optimal control. It also treats both continuous-time and discrete-time optimal control systems, giving students a firm grasp on both methods. Among this book's most outstanding features is a summary table that accompanies each topic or problem and includes a statement of the problem with a step-by-step solution. Students will also gain valuable experience in using industry-standard MATLAB and SIMULINK software, including the Control System and Symbolic Math Toolboxes. Diverse applications across fields from power engineering to medicine make a foundation in optimal control systems an essential part of an engineer's background. This clear, streamlined presentation is ideal for a graduate level course on control systems and as a quick reference for working engineers.

Optimal Control-Brian D. O. Anderson 2007-02-27

Numerous examples highlight this treatment of the use of linear quadratic Gaussian methods for control system design. It explores linear optimal control theory from an engineering viewpoint, with illustrations of practical applications. Key topics include loop-recovery techniques, frequency shaping, and controller reduction. Numerous examples and complete solutions. 1990 edition.

Applied Linear Optimal Control Paperback with CD-ROM-Arthur E. Bryson 2002-08-29

CD-ROM contains: MATLAB codes of the OPTEST toolbox -- Code for examples, figures, and selected problems in text.

Nonlinear and Optimal Control Systems-Thomas L. Vincent 1997-06-23

Designed for one-semester introductory senior-or graduate-level course, the authors provide the student with an introduction of analysis techniques used in the design of nonlinear and optimal feedback control systems. There is special emphasis on the fundamental topics of stability, controllability, and optimality, and on the corresponding geometry associated with these topics. Each chapter contains several examples and a variety of exercises.

Linear Systems-Alok Sinha 2007-01-31

Balancing rigorous theory with practical applications, Linear Systems: Optimal and Robust Control explains the concepts behind linear systems, optimal control, and robust control and illustrates these concepts with concrete examples and problems. Developed as a two-course book, this self-contained text first discusses linear systems, including controllability, observability, and matrix fraction description. Within this framework, the author develops the ideas of state feedback control and observers. He then examines optimal control, stochastic optimal control, and the lack of robustness of linear quadratic Gaussian (LQG) control. The book subsequently presents robust control techniques and derives $H\infty$ control theory from the first principle, followed by a discussion of the sliding mode control of a linear system. In addition, it shows how a blend of sliding mode control and $H\infty$ methods can enhance the robustness of a linear system. By learning the theories and algorithms as well as exploring the examples in Linear Systems: Optimal and Robust Control, students will be able to better understand and ultimately better manage engineering processes and systems.

Optimal Control and Estimation-Robert F. Stengel 2012-10-16

Graduate-level text provides introduction to optimal control theory for stochastic systems, emphasizing application of basic concepts to real problems.

Optimal Control-Leonid T. Aschepkov 2017-01-11

This book is based on lectures from a one-year course at the Far Eastern Federal University (Vladivostok, Russia) as well as on workshops on optimal control offered to students at various mathematical departments at the university level. The main themes of the theory of linear and nonlinear systems are considered, including the basic problem of establishing the necessary and sufficient conditions of optimal processes. In the first part of the course, the theory of linear control systems is constructed on the basis of the separation theorem and the concept of a reachability set. The authors prove the closure of a reachability set in the class of piecewise continuous controls, and the problems of controllability, observability, identification, performance and terminal control are also considered. The second part of the course is devoted to nonlinear control systems. Using the method of variations and the Lagrange multipliers rule of nonlinear problems, the authors prove the Pontryagin maximum principle for problems with mobile ends of trajectories. Further exercises and a large number of additional tasks are provided for use as practical training in order for the reader to consolidate the theoretical material.

The Theory and Application of Linear Optimal Control-Edmund G. Rynaski 1965

Linear optimal control theory has produced an important synthesis technique for the design of linear multivariable systems. In the present study, efficient design procedures, based on the general optimal theory, have been developed. These procedures make use of design techniques which are similar to the conventional methods of control system analysis. Specifically, a scalar expression is developed which relates the closed-loop poles of the multi- controller, multi-output optimal system to the weighting parameters of a quadratic performance index. Methods analogous to the root locus and Bode plot techniques are then developed for the systematic analysis of this expression. Examples using the aircraft longitudinal equations of motion to represent the object to be controlled are presented to illustrate design procedures which can be carried out in either the time or frequency domains. Both the model-in -the- performance-index and model-following concepts are employed in several of the examples to illustrate the model approach to optimal design.

Design criterion for improving the sensitivity of linear optimal control systems-Mushtaq Ahmed 1969

Continuous Time Dynamical Systems-B.M. Mohan 2018-10-08

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

Linear Optimal Control-Jeffrey B. Burl 1999

Preface; List of symbols; Introduction; Analysis of control systems; Multivariable systems; Vector random processes; Performance; Robustness; The linear quadratic regulator; The Kalman filter; Linear quadratic Gaussian control; Control; Ful information control estimation; H [infinity symbol] output feedback; Controller order reduction; Appendix: Mathematical notes.

Linear Control Theory-Shankar P. Bhattacharyya 2018-10-03

Successfully classroom-tested at the graduate level, Linear Control Theory: Structure, Robustness, and Optimization covers three major areas of control engineering (PID control, robust control, and optimal control). It provides balanced coverage of elegant mathematical theory and useful engineering-oriented results. The first part of the book develops results relating to the design of PID and first-order controllers for continuous and discrete-time linear systems with possible delays. The second section deals with the robust stability and performance of systems under parametric and unstructured uncertainty. This section describes several elegant and sharp results, such as Kharitonov's theorem and its extensions, the edge theorem, and the mapping theorem. Focusing on the optimal control of linear systems, the third part discusses the standard theories of the linear quadratic regulator, Hinfinity and l1 optimal control, and associated results. Written by recognized leaders in the field, this book explains how control theory can be applied to the design of real-world systems. It shows that the techniques of three term controllers, along with the results on robust and optimal control, are invaluable to developing and solving research problems in many areas of engineering.

Optimal Control Of Singularly Perturbed Linear Systems And Applications-Zoran Gajic 2001-01-04

Highlights the Hamiltonian approach to singularly perturbed linear optimal control systems. Develops parallel algorithms in independent slow and fast time scales for solving various optimal linear control and filtering problems in standard and nonstandard singularly perturbed systems, continuous- and discrete-time, deterministic and stochastic, mul

Parallel Algorithms for Optimal Control of Large Scale Linear Systems-Zoran Gajic 2012-12-06

Parallel Algorithms for Optimal Control of Large Scale Linear Systems is a comprehensive presentation for both linear and bilinear systems. The parallel algorithms presented in this book are applicable to a wider class of practical systems than those served by traditional methods for large scale singularly perturbed and weakly coupled systems based on the power-series expansion methods. It is intended for scientists and advance graduate students in electrical engineering and computer science who deal with parallel algorithms and control systems, especially large scale systems. The material presented is both comprehensive and unique.

Optimal Control Of Singularly Perturbed Linear Systems And Applications-Zoran Gajic 2001-01-04

Highlighing the Hamiltonian approach to singularly perturbed linear optimal control systems, this volume develops parallel algorithms in independent slow and fast time scales to solve various optimal linear control and filtering problems.

Concepts of General System Theory in the Linear Optimal Control Problem-Harold Nicholson 1970

Turnpike Theory of Continuous-Time Linear Optimal Control Problems-Alexander J. Zaslavski 2015-07-01

Individual turnpike results are of great interest due to their numerous applications in engineering and in economic theory; in this book the study is focused on new results of turnpike phenomenon in linear optimal control problems. The book is intended for engineers as well as for mathematicians interested in the calculus of variations, optimal control and in applied functional analysis. Two large classes of problems are studied in more depth. The first class studied in Chapter 2 consists of linear control problems with periodic nonsmooth convex integrands. Chapters 3-5 consist of linear control problems with autonomous convex smooth integrands. Chapter 6 discusses a turnpike property for dynamic zero-sum games with linear constraints. Chapter 7 examines genericity results. In Chapter 8, the description of structure of variational problems with extended-valued integrands is obtained. Chapter 9 ends the exposition with a study of turnpike phenomenon for dynamic games with extended value integrands.

An Algorithm for Linear Optimal Control Systems with State Space Constraints-Kailash C. Kapur 1969*

Equivalence of Quadratic Performance Indices for Linear Optimal Control Systems-Kolowrocki, Wojciech 1973

Optimal Control Systems by AA Fel'Dbaum- 1966-01-01

In this book, we study theoretical and practical aspects of computing methods for mathematical modelling of nonlinear systems. A number of computing techniques are considered, such as methods of operator approximation with any given accuracy; operator interpolation techniques including a non-Lagrange interpolation; methods of system representation subject to constraints associated with concepts of causality, memory and stationarity; methods of system representation with an accuracy that is the best within a given class of models; methods of covariance matrix estimation; methods for low-rank matrix approximations; hybrid methods based on a combination of iterative procedures and best operator approximation; and methods for information compression and filtering under condition that a filter model should satisfy restrictions associated with causality and different types of memory. As a result, the book represents a blend of new methods in general computational analysis, and specific, but also generic, techniques for study of systems theory ant its particular branches, such as optimal filtering and information compression. - Best operator approximation, - Non-Lagrange interpolation, - Generic Karhunen-Loeve transform - Generalised low-rank matrix approximation - Optimal data compression - Optimal nonlinear filtering

Optimization and Control with Applications-Liqun Qi 2006-03-30

A collection of 28 refereed papers grouped according to four broad topics: duality and optimality conditions, optimization algorithms, optimal control, and variational inequality and equilibrium problems. Suitable for researchers, practitioners and postgrads.

Sensitivity-constrained Linear Optimal Control-John Robert Sesak 1974

Optimal Control Theory for Infinite Dimensional Systems-Xungjing Li 2012-12-06

Infinite dimensional systems can be used to describe many phenomena in the real world. As is well known, heat conduction, properties of elastic plastic material, fluid dynamics, diffusion-reaction processes, etc., all lie within this area. The object that we are studying (temperature, displace ment, concentration, velocity, etc.) is usually referred to as the state. We are interested in the case where the state satisfies proper differential equa tions that are derived from certain physical laws, such as Newton's law, Fourier's law etc. The space in which the state exists is called the state space, and the equation that the state satisfies is called the state equation. By an infinite dimensional system we mean one whose corresponding state space is infinite dimensional. In particular, we are interested in the case where the state equation is one of the following types: partial differential equation, functional differential equation, integro-differential equation, or abstract evolution equation. The case in which the state equation is being a stochastic differential equation is also an infinite dimensional problem, but we will not discuss such a case in this book.

Infinite Dimensional Linear Control Systems- 2005-07-12

For more than forty years, the equation $y'(t) = Ay(t) + u(t)$ in Banach spaces has been used as model for optimal control processes described by partial differential equations, in particular heat and diffusion processes. Many of the outstanding open problems, however, have remained open until recently, and some have never been solved. This book is a survey of all results know to the author, with emphasis on very recent results (1999 to date). The book is restricted to linear equations and two particular problems (the time optimal problem, the norm optimal problem) which results in a more focused and concrete treatment. As experience shows, results on linear equations are the basis for the treatment of their semilinear counterparts, and techniques for the time and norm optimal problems can often be generalized to more general cost functionals. The main object of this book is to be a state-of-the-art monograph on the theory of the time and norm optimal controls for y’(t) = Ay(t) + u(t) that ends at the very latest frontier of research, with open problems and indications for future research. Key features: · Applications to optimal diffusion processes. · Applications to optimal heat propagation processes. · Modelling of optimal processes governed by partial differential equations. · Complete bibliography. · Includes the latest research on the subject. · Does not assume anything from the reader except basic functional analysis. · Accessible to researchers and advanced graduate students alike · Applications to optimal diffusion processes. · Applications to optimal heat propagation processes. · Modelling of optimal processes governed by partial differential equations. · Complete bibliography. · Includes the latest research on the subject. · Does not assume anything from the reader except basic functional analysis. · Accessible to researchers and advanced graduate students alike

Robust and Optimal Control-Mi-Ching Tsai 2014-01-07

A Two-port Framework for Robust and Optimal Control introduces an alternative approach to robust and optimal controller synthesis procedures for linear, time-invariant systems, based on the two-port system widespread in electrical engineering. The novel use of the two-port system in this context allows straightforward engineering-oriented solution-finding procedures to be developed, requiring no mathematics beyond linear algebra. A chain-scattering description provides a unified framework for constructing the stabilizing controller set and for synthesizing H2 optimal and H∞ sub-optimal controllers. Simple yet illustrative examples explain each step. A Two-port Framework for Robust and Optimal Control features: · a hands-on, tutorial-style presentation giving the reader the opportunity to repeat the designs presented and easily to modify them for their own programs; · an abundance of examples illustrating the most important steps in robust and optimal design; and · end-of-chapter exercises. To further demonstrate the proposed approaches, in the last chapter an application case study is presented which demonstrates the use of the framework in a real-world control system design and helps the reader quickly move on with their own challenges. MATLAB® codes used in examples throughout the book and solutions to selected exercise questions are available for download. The text will have particular resonance for researchers in control with an electrical engineering background, who wish to avoid spending excessive time in learning complex mathematical, theoretical developments but need to know how to deal with robust and optimal control synthesis problems. Please see [http://km.emotors.ncku.edu.tw/class/hw1.html] for solutions to the exercises provided in this book.

Optimal Control of Distributed Systems with Conjugation Conditions-Ivan V. Sergienko 2005-02-10

At present, in order to resolve problems of ecology and to save mineral resources for future population generations, it is quite necessary to know how to maintain nature arrangement in an efficient way. It is possible to achieve a rational nature arrangement when analyzing solutions to problems concerned with optimal control of distributed systems and with optimization of modes in which main ground medium processes are functioning (motion of liquids, generation of temperature fields, mechanical deformation of multicomponent media). Such analysis becomes even more difficult because of heterogeneity of the region that is closest to the Earth surface, and thin inclusions/cracks in it exert their essential influence onto a state and development of the mentioned processes, especially in the cases of mining. Many researchers, for instance, A.N. Tikhonov - A.A. Samarsky [121], L. Luckner - W.M. Shestakow [65], Tien-Mo Shih, K.L. Johnson [47], E. Sanchez-Palencia [94] and others stress that it is necessary to consider how thin inclusions/cracks exert their influences onto development of these processes, while such inclusions differ in characteristics from main media to a considerable extent (moisture permeability, permeability to heat, bulk density or shear strength may be mentioned). Xll An influence exerted from thin interlayers onto examined processes is taken into account sufficiently adequately by means of various constraints, namely, by the conjugation conditions [4, 8, 10, 15, 17-20, 22-26, 38, 44, 47, 52, 53, 68, 76, 77, 81, 83, 84, 90, 95, 96-100, 112-114, 117, 123].

Sensitivity Considerations in a Second Order Linear Optimal Control System-Robert Leslie Ryan 1968

Nonlinear Optimal Control Theory-Leonard David Berkovitz 2012-08-25

Nonlinear Optimal Control Theory presents a deep, wide-ranging introduction to the mathematical theory of the optimal control of processes governed by ordinary differential equations and certain types of differential equations with memory. Many examples illustrate the mathematical issues that need to be addressed when using optimal control techniques in diverse areas. Drawing on classroom-tested material from Purdue University and North Carolina State University, the book gives a unified account of bounded state problems governed by ordinary, integrodifferential, and delay systems. It also discusses Hamilton-Jacobi theory. By providing a sufficient and rigorous treatment of finite dimensional control problems, the book equips readers with the foundation to deal with other types of control problems, such as those governed by stochastic differential equations, partial differential equations, and differential games.

On the Design of Insensitive Linear Optimal Control Systems-Georg Grübel 1967

Optimal Control-Frank L. Lewis 1995-11-03

This new, updated edition of Optimal Control reflects major changes that have occurred in the field in recent years and presents, in a clear and direct way, the fundamentals of optimal control theory. It covers the major topics involving measurement, principles of optimality, dynamic programming, variational methods, Kalman filtering, and other solution techniques. To give the reader a sense of the problems that can arise in a hands-on project, the authors have included new material on optimal output feedback control, a technique used in the aerospace industry. Also included are two new chapters on robust control to provide background in this rapidly growing area of interest. Relations to classical control theory are emphasized throughout the text, and a root-locus approach to steady-state controller design is included. A chapter on optimal control of polynomial systems is designed to give the reader sufficient background for further study in the field of adaptive control. The authors demonstrate through numerous examples that computer simulations of optimal controllers are easy to implement and help give the reader an intuitive feel for the equations. To help build the reader's confidence in understanding the theory and its practical applications, the authors have provided many opportunities throughout the book for writing simple programs. Optimal Control will also serve as an invaluable reference for control engineers in the industry. It offers numerous tables that make it easy to find the equations needed to implement optimal controllers for practical applications. All simulations have been performed using MATLAB and relevant Toolboxes. Optimal Control assumes a background in the state-variable representation of systems; because matrix manipulations are the basic mathematical vehicle of the book, a short review is included in the appendix. A lucid introductory text and an invaluable reference, Optimal Control will serve as a complete tool for the professional engineer and advanced student alike. As a superb introductory text and an indispensable reference, this new edition of Optimal Control will serve the needs of both the professional engineer and the advanced student in mechanical, electrical, and aerospace engineering. Its coverage encompasses all the fundamental topics as well as the major changes of recent years, including output-feedback design and robust design. An abundance of computer simulations using MATLAB and relevant Toolboxes is included to give the reader the actual experience of applying the theory to real-world situations. Major topics covered include: Static Optimization Optimal Control of Discrete-Time Systems Optimal Control of Continuous-Time Systems

The Tracking Problem and Other LQR Extensions Final-Time-Free and Constrained Input Control Dynamic Programming Optimal Control for Polynomial Systems Output Feedback and Structured Control Robustness and Multivariable Frequency-Domain Techniques

Optimal Control-Zoran Gajic 2018-10-03

Unique in scope, Optimal Control: Weakly Coupled Systems and Applications provides complete coverage of modern linear, bilinear, and nonlinear optimal control algorithms for both continuous-time and discrete-time weakly coupled systems, using deterministic as well as stochastic formulations. This book presents numerous applications to real world systems from various industries, including aerospace, and discusses the design of subsystem-level optimal filters. Organized into independent chapters for easy access to the material, this text also contains several case studies, examples, exercises, computer assignments, and formulations of research problems to help instructors and students.

Optimal Control of Dynamic Systems Driven by Vector Measures-N. U. Ahmed 2021-10-15

This book is devoted to the development of optimal control theory for finite dimensional systems governed by deterministic and stochastic differential equations driven by vector measures. The book deals with a broad class of controls, including regular controls (vector-valued measurable functions), relaxed controls (measure-valued functions) and controls determined by vector measures, where both fully and partially observed control problems are considered. In the past few decades, there have been remarkable advances in the field of systems and control theory thanks to the unprecedented interaction between mathematics and the physical and engineering sciences. Recently, optimal control theory for dynamic systems driven by vector measures has attracted increasing interest. This book presents this theory for dynamic systems governed by both ordinary and stochastic differential equations, including extensive results on the existence of optimal controls and necessary conditions for optimality. Computational algorithms are developed based on the optimality conditions, with numerical results presented to demonstrate the applicability of the theoretical results developed in the book. This book will be of interest to researchers in optimal control or applied functional analysis interested in applications of vector measures to control theory, stochastic systems driven by vector measures, and related topics. In particular, this self-contained account can be a starting point for further advances in the theory and applications of dynamic systems driven and controlled by vector measures.

Nonlinear Industrial Control Systems-Michael J. Grimble 2020-05-19

Nonlinear Industrial Control Systems presents a range of mostly optimisation-based methods for severely nonlinear systems; it discusses feedforward and feedback control and tracking control systems design. The plant models and design algorithms are provided in a MATLAB® toolbox that enable both academic examples and industrial application studies to be repeated and evaluated, taking into account practical application and implementation problems. The text makes nonlinear control theory accessible to readers having only a background in linear systems, and concentrates on real applications of nonlinear control. It covers: different ways of modelling nonlinear systems including state space, polynomial-based, linear parameter varying, state-dependent and hybrid; design techniques for nonlinear optimal control including generalised-minimum-variance, model predictive control, quadratic-Gaussian, factorised and H∞ design methods; design philosophies that are suitable for aerospace, automotive, marine, process-control, energy systems, robotics, servo systems and manufacturing; steps in design procedures that are illustrated in design studies to define cost-functions and cope with problems such as disturbance rejection, uncertainties and integral wind-up; and baseline non-optimal control techniques such as nonlinear Smith predictors, feedback linearization, sliding mode control and nonlinear PID. Nonlinear Industrial Control Systems is valuable to engineers in industry dealing with actual nonlinear systems. It provides students with a comprehensive range of techniques and examples for solving real nonlinear control design problems.

Kalman Filtering-Charles K. Chui 2013-06-29

In addition to making a number of minor corrections and updat ing the references, we have expanded the section on "real-time system identification" in Chapter 10 of the first edition into two sections and combined it with Chapter 8. In its place, a very brief introduction to wavelet analysis is included in Chapter 10. Although the pyramid algorithms for wavelet decompositions and reconstructions are quite different from the Kalman filtering al gorithms, they can also be applied to time-domain filtering, and it is hoped that splines and wavelets can be incorporated with Kalman filtering in the near future. College Station and Houston Charles K. Chui September 1990 Guanrong Chen Preface to the First Edition Kalman filtering is an optimal state estimation process applied to a dynamic system that involves random perturbations. More precisely, the Kalman filter gives a linear, unbiased, and min imum error variance recursive algorithm to optimally estimate the unknown state of a dynamic system from noisy data taken at discrete real-time. It has been widely used in many areas of industrial and government applications such as video and laser tracking systems, satellite navigation, ballistic missile trajectory estimation, radar, and fire control. With the recent development of high-speed computers, the Kalman filter has become more use ful even for very complicated real-time applications.