Control Of Linear Parameter Varying Systems With Applications

Linear Parameter-varying System Identification Modeling and Identification of Linear Parameter-Varying Systems *Control of Linear Parameter Varying Systems with Applications* *Control of Linear Parameter Varying Systems* *Linear Parameter-Varying and Time-Delay Systems* **Identification and Robust Control of Linear Parameter-varying Systems** Robust Control and Linear Parameter Varying Approaches **Linear Parameter-Varying Control for Engineering Applications** **Robust Control and Linear Parameter Varying Approaches** Modeling and Identification of Linear Parameter-Varying Systems **Linear Parameter-Varying Control of Systems of High Complexity** **Linear Time-varying Systems** **Recent Advances in Intelligent Engineering** *Linear Parameter-Varying and Time-Delay Systems* Linear, Time-varying Approximations to Nonlinear Dynamical Systems **Diagnosis and Fault-tolerant Control Volume 2** Robust Control Design for Active Driver Assistance Systems **Recursive Filtering for 2-D Shift-Varying Systems with Communication Constraints** Robust Control of Linear Systems Subject to Uncertain Time-Varying Parameters **Sensitivity Methods in Control Theory** Model Predictive Control in the Process Industry System Identification Feedback Systems **Linear Parameter-Varying Control for Engineering Applications** **Nonlinear Control and Filtering for Stochastic Networked Systems** **Fault Diagnosis for Linear Discrete Time-Varying Systems and Its Applications** **Physiological Control Systems** **Control of Uncertain Dynamic Systems** Iterative Methods for Sparse Linear Systems *Linear State-Space Control Systems* *Delay Compensation for Nonlinear, Adaptive, and PDE Systems* **Elements of Applied Bifurcation Theory** **Stability, Control, and Computation for Time-Delay Systems** *Rough Sets and Current Trends in Computing* **Delay Systems** *Applied Nonlinear Control* Analysis of Linear Parameter Varying System Models Based on Reachable Sets **Adaptive Filtering Prediction and Control** *Resource Allocation and Cross-layer Control in Wireless Networks* **Programming Embedded Systems**

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Linear Parameter-Varying Control of Systems of High Complexity Dec 22 2021

Physiological Control Systems Aug 06 2020 A guide to common control principles and how they are used to characterize a variety of physiological mechanisms The second edition of Physiological Control Systems offers an updated and comprehensive resource that reviews the fundamental concepts of classical control theory and how engineering methodology can be applied to obtain a quantitative understanding of physiological systems. The revised text also contains more advanced topics that feature applications to physiology of nonlinear dynamics, parameter estimation methods, and adaptive estimation and control. The author–a noted expert in the field–includes a wealth of worked examples that illustrate key concepts and methodology and offers in-depth analyses of selected physiological control models that highlight the topics presented. The author discusses the most noteworthy developments in system identification, optimal control, and nonlinear dynamical analysis and targets recent bioengineering advances. Designed to be a practical resource, the text includes guided experiments with simulation models (using Simulink/Matlab). Physiological Control Systems focuses on common control principles that can be used to characterize a broad variety of physiological mechanisms. This revised resource: Offers new sections that explore identification of nonlinear and time-varying systems, and provide the background for understanding the link between continuous-time and discrete-time dynamic models Presents helpful, hands-on experimentation with computer simulation models Contains fully updated problems and exercises at the end of each chapter Written for biomedical engineering students and biomedical scientists, Physiological Control Systems, offers an updated edition of this key resource for understanding classical control theory and its application to physiological systems. It also contains contemporary topics and methodologies that shape bioengineering research today.

Control of Linear Parameter Varying Systems Jul 29 2022

Robust Control of Linear Systems Subject to Uncertain Time-Varying Parameters Apr 13 2021

Control of Linear Parameter Varying Systems with Applications Aug 30 2022 Control of Linear Parameter Varying Systems compiles state-of-the-art contributions on novel analytical and computational methods for addressing system identification, model reduction, performance analysis and feedback control design and addresses address theoretical developments, novel computational approaches and illustrative applications to various fields. Part I discusses modeling and system identification of linear parameter varying systems, Part II covers the importance of analysis and control design when working with linear parameter varying systems (LPVS) , Finally, Part III presents an applications based approach to linear parameter varying systems, including modeling of a turbocharged diesel engines, Multivariable control of wind turbines, modeling and control of aircraft engines, control of an autonomous underwater vehicles and analysis and synthesis of re-entry vehicles.

Adaptive Filtering Prediction and Control Aug 25 2019 This unified survey focuses on linear discrete-time systems and explores natural extensions to nonlinear systems. It emphasizes discrete-time systems, summarizing theoretical and practical aspects of a large class of adaptive algorithms. 1984 edition.

Recent Advances in Intelligent Engineering Oct 20 2021 This book gathers contributions on fuzzy neural control, intelligent and non-linear control, dynamic systems and cyber-physical systems. It presents the latest theoretical and practical results, including numerous applications of computational intelligence in various disciplines such as engineering, medicine, technology and the environment. The book is dedicated to Imre J. Rudas on his seventieth birthday.

Robust Control and Linear Parameter Varying Approaches Apr 25 2022 Vehicles are complex systems (non-linear, multi-variable) where the abundance of embedded controllers should ensure better security. This book aims at emphasizing the interest and potential of Linear Parameter Varying methods within the framework of vehicle dynamics, e.g. proposed control-oriented model, complex enough to handle some system non linearities but still simple for control or observer design, take into account the adaptability of the vehicle's response to driving situations, to the driver request and/or to the road sollicitations, manage interactions between various actuators to optimize the dynamic behavior of vehicles. This book results from the 32th International Summer School in Automatic that held in Grenoble, France, in September 2011, where recent methods (based on robust control and LPV technics), then applied to the control of vehicle dynamics, have been presented. After some theoretical background and a view on some recent works on LPV approaches (for modelling, analysis, control, observation and diagnosis), the main emphasis is put on road vehicles but some illustrations are concerned with railway, aerospace and underwater vehicles. The main objective of the book is to demonstrate the value of this approach for controlling the dynamic behavior of vehicles. It presents, in a rm way, background and new results on LPV methods and their application to vehicle dynamics.

Control of Uncertain Dynamic Systems Jul 05 2020 This book is a collection of 34 papers presented by leading researchers at the International Workshop on Robust Control held in San Antonio, Texas in March 1991. The common theme tying these papers together is the analysis, synthesis, and design of control systems subject to various uncertainties. The papers describe the latest results in parametric understanding, H8 uncertainty, l1 optical control, and Quantitative Feedback Theory (QFT). The book is the first to bring together all the diverse points of view addressing the robust control problem and should strongly influence development in the robust control field for years to come. For this reason, control theorists, engineers, and applied mathematicians should consider it a crucial acquisition for their libraries.

Resource Allocation and Cross-layer Control in Wireless Networks Jul 25 2019 Information flow in a telecommunication network is accomplished through the interaction of mechanisms at various design layers with the end goal of supporting the information exchange needs of the applications. In wireless networks in particular, the different layers interact in a nontrivial manner in order to support information transfer. In this text we will present abstract models that capture the cross-layer interaction from the physical to transport layer in wireless network architectures including cellular, ad-hoc and sensor networks as well as hybrid wireless-wireline. The model allows for arbitrary network topologies as well as traffic forwarding modes, including datagrams and virtual circuits. Furthermore the time varying nature of a wireless network, due either to fading channels or to changing connectivity due to mobility, is adequately captured in our model to allow for state dependent network control policies. Quantitative performance measures that capture the quality of service requirements in these systems depending on the supported applications are discussed, including throughput maximization, energy consumption minimization, rate utility function maximization as well as general performance functionals. Cross-layer control algorithms with optimal or suboptimal performance with respect to the above measures are presented and analyzed. A detailed exposition of the related analysis and design techniques is provided.

Linear Time-varying Systems Nov 20 2021 Provides the mathematical framework for controlling and analyzing linear time-varying systems

Linear Parameter-varying System Identification Nov 01 2022 This review volume reports the state-of-the-art in Linear Parameter Varying (LPV) system identification. It focuses on the most recent LPV identification methods for both discrete-time and continuous-time models--

Modeling and Identification of Linear Parameter-Varying Systems Jan 23 2022 Through the past 20 years, the framework of Linear Parameter-Varying (LPV) systems has become a promising system theoretical approach to handle the control of mildly nonlinear and especially position dependent systems which are common in mechatronic applications and in the process industry. The birth of this system class was initiated by the need of engineers to achieve better performance for nonlinear and time-varying dynamics, c- mon in many industrial applications, than what the classical framework of Linear Time-Invariant (LTI) control can provide. However, it was also a p- mary goal to preserve simplicity and "re-use" the powerful LTI results by extending them to the LPV case. The progress continued according to this philosophy and LPV control has become a well established ?eld with many promising applications. Unfortunately, modeling of LPV systems, especially based on measured data (which is called system identi?cation) has seen a limited development sincethebirthoftheframework. Currentlythisbottleneck oftheLPVfra- work is halting the transfer of the LPV theory into industrial use. Without good models that ful?ll the expectations of the users and without the und- standing how these models correspond to the dynamics of the application, it is di?cult to design high performance LPV control solutions. This book aims to bridge the gap between modeling and control by investigating the fundamental questions of LPV modeling and identi?cation. It explores the missing details of the LPV system theory that have hindered the formu- tion of a well established identi?cation framework.

Linear State-Space Control Systems May 03 2020 The book blends readability and accessibility common to undergraduate control systems texts with the mathematical rigor necessary to form a solid theoretical foundation. Appendices cover linear algebra and provide a Matlab overivew and files. The reviewers pointed out that this is an ambitious project but one that will pay off because of the lack of good up-to-date textbooks in the area.

Linear Parameter-Varying and Time-Delay Systems Sep 18 2021 This book provides an introduction to the analysis and control of Linear Parameter-Varying Systems and Time-Delay Systems and their interactions. The purpose is to give the readers some fundamental theoretical background on these topics and to give more insights on the possible applications of these theories. This self-contained monograph is written in an accessible way for readers ranging from undergraduate/PhD students to engineers and researchers willing to know more about the fields of time-delay systems, parameter-varying systems, robust analysis, robust control, gain-scheduling techniques in the LPV fashion and LMI based approaches. The only prerequisites are basic knowledge in linear algebra, ordinary differential equations and (linear) dynamical systems. Most of the results are proved unless the proof is too complex or not necessary for a good understanding of the results. In the latter cases, suitable references are systematically provided. The first part pertains on the representation, analysis and control of LPV systems along with a reminder on robust analysis and control techniques. The second part is concerned with the representation and analysis of time-delay systems using various time-domain techniques. The third and last part is devoted to the representation, analysis, observation, filtering and control of LPV time-delay systems. The book also presents many important basic and advanced results on the manipulation of LMIs.

Robust Control Design for Active Driver Assistance Systems Jun 15 2021 This monograph focuses on control methods that influence vehicle dynamics to assist the driver in enhancing passenger comfort, road holding, efficiency and safety of transport, etc., while maintaining the driver's ability to override that assistance. On individual-vehicle-component level the control problem is formulated and solved by a unified modelling and design method provided by the linear parameter varying (LPV) framework. The global behaviour desired is achieved by a judicious interplay between the individual components, guaranteed by an integrated control mechanism. The integrated control problem is also formalized and solved in the LPV framework. Most important among the ideas expounded in the book are: application of the LPV paradigm in the modelling and control design methodology; application of the robust LPV design as a unified framework for setting control tasks related to active driver assistance; formulation and solution proposals for the integrated vehicle control problem; proposal for a reconfigurable and fault-tolerant control architecture; formulation and solution proposals for the plug-and-play concept; detailed case studies. Robust Control Design for Active Vehicle Assistance Systems will be of interest to academic researchers and graduate students interested in automotive control and to control and mechanical engineers working in the automotive industry. Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.

Linear, Time-varying Approximations to Nonlinear Dynamical Systems Aug 18 2021 Linear, Time-varying Approximations to Nonlinear Dynamical Systems introduces a new technique for analysing and controlling nonlinear systems. This method is general and requires only very mild conditions on the system nonlinearities, setting it apart from other techniques such as those - well-known - based on differential geometry. The authors cover many aspects of nonlinear systems including stability theory, control design and extensions to distributed parameter systems. Many of the classical and modern control design methods which can be applied to linear, time-varying systems can be extended to nonlinear systems by this technique. The implementation of the control is therefore simple and can be done with well-established classical methods. Many aspects of nonlinear systems, such as spectral theory which is important for the generalisation of frequency domain methods, can be approached by this method.

Linear Parameter-Varying Control for Engineering Applications Mar 25 2022 The subject of this brief is the application of linear parameter-varying (LPV) control to a class of dynamic systems to provide a systematic synthesis of gain-scheduling controllers with guaranteed stability and performance. An important step in LPV control design, which is not well covered in the present literature, is the selection of weighting functions. The proper selection of weighting functions tunes the controller to obtain the desired closed-loop response. The selection of appropriate weighting functions is difficult and sometimes appears arbitrary. In this brief, gain-scheduling control with engineering applications is covered in detail, including the LPV modeling, the control problem formulation, and the weighting function optimization. In addition, an iterative algorithm for obtaining optimal output weighting functions with respect to the H2 norm bound is presented in this brief. Using this algorithm, the selection of appropriate weighting functions becomes an automatic process. The LPV design and control synthesis procedures in this brief are illustrated using: · air-to-fuel ratio control for port-fuel-injection engines; · variable valve timing control; and · application to a vibration control problem. After reading this brief, the reader will be able to apply its concepts to design gain-scheduling controllers for their own engineering applications. This brief provides detailed step-by-step LPV modeling and control design strategies along with an automatic weight-selection algorithm so that engineers can apply state-of-the-art LPV control synthesis to solve their own engineering problems. In addition, this brief should serve as a bridge between the H-infinity and H2 control theory and the real-world application of gain-scheduling control.

Iterative Methods for Sparse Linear Systems Jun 03 2020 Mathematics of Computing -- General.

Linear Parameter-Varying and Time-Delay Systems Jun 27 2022 This book provides an introduction to the analysis and control of Linear Parameter-Varying Systems and Time-Delay Systems and their interactions. The purpose is to give the readers some fundamental theoretical background on these topics and to give more insights on the possible applications of these theories. This self-contained monograph is written in an accessible way for readers ranging from undergraduate/PhD students to engineers and researchers willing to know more about the fields of time-delay systems, parameter-varying systems, robust analysis, robust control, gain-scheduling techniques in the LPV fashion and LMI based approaches. The only prerequisites are basic knowledge in linear algebra, ordinary differential equations and (linear) dynamical systems. Most of the results are proved unless the proof is too complex or not necessary for a good understanding of the results. In the latter cases, suitable references are systematically provided. The first part pertains on the representation, analysis and control of LPV systems along with a reminder on robust analysis and control techniques. The second part is concerned with the representation and analysis of time-delay systems using various time-domain techniques. The third and last part is devoted to the representation, analysis, observation, filtering and control of LPV time-delay systems. The book also presents many important basic and advanced results on the manipulation of LMIs.

Feedback Systems Dec 10 2020 The essential introduction to the principles and applications of feedback systems–now fully revised and expanded This textbook covers the mathematics needed to model, analyze, and design feedback systems. Now more user-friendly than ever, this revised and expanded edition of Feedback Systems is a one-volume resource for students and researchers in mathematics and engineering. It has applications 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. Features a new chapter on design principles and tools, illustrating the types of problems that can be solved using feedback Includes a new chapter on fundamental limits and new material on the Routh-Hurwitz criterion and root locus plots Provides exercises at the end of every chapter Comes with an electronic solutions manual An ideal textbook for undergraduate and graduate students Indispensable for researchers seeking a self-contained resource on control theory

Delay Compensation for Nonlinear, Adaptive, and PDE Systems Apr 01 2020 Shedding light on new opportunities in predictor feedback, this book significantly broadens the set of techniques available to a mathematician or engineer working on delay systems. It is a collection of tools and techniques that make predictor feedback ideas applicable to nonlinear systems, systems modeled by PDEs, systems with highly uncertain or completely unknown input/output delays, and systems whose actuator or sensor dynamics are modeled by more general hyperbolic or parabolic PDEs, rather than by pure delay. Replete with examples, Delay Compensation for Nonlinear, Adaptive, and PDE Systems is an excellent reference guide for graduate students, researchers, and professionals in mathematics, systems control, as well as chemical, mechanical, electrical, computer, aerospace, and civil/structural engineering. Parts of the book may be used in graduate courses on general distributed parameter systems, linear delay systems, PDEs, nonlinear control, state estimator and observers, adaptive control, robust control, or linear time-varying systems.

Linear Parameter-Varying Control for Engineering Applications Nov 08 2020 The subject of this brief is the application of linear parameter-varying (LPV) control to a class of dynamic systems to provide a systematic synthesis of gain-scheduling controllers with guaranteed stability and performance. An important step in LPV control design, which is not well covered in the present literature, is the selection of weighting functions. The proper selection of weighting functions tunes the controller to obtain the desired closed-loop response. The selection of appropriate weighting functions is difficult and sometimes appears arbitrary. In this brief, gain-scheduling control with engineering applications is covered in detail, including the LPV modeling, the control problem formulation, and the weighting function optimization. In addition, an iterative algorithm for obtaining optimal output weighting functions with respect to the H2 norm bound is presented in this brief. Using this algorithm, the selection of appropriate weighting functions becomes an automatic process. The LPV design and control synthesis procedures in this brief are illustrated using: · air-to-fuel ratio control for port-fuel-injection engines; · variable valve timing control; and · application to a vibration control problem. After reading this brief, the reader will be able to apply its concepts to design gain-scheduling controllers for their own engineering applications. This brief provides detailed step-by-step LPV modeling and control design strategies along with an automatic weight-selection algorithm so that engineers can apply state-of-the-art LPV control synthesis to solve their own engineering problems. In addition, this brief should serve as a bridge between the H-infinity and H2 control theory and the real-world application of gain-scheduling control.

Sensitivity Methods in Control Theory Mar 13 2021 Sensitivity Methods in Control Theory is a collection of manuscripts presented as the Third International Symposium of Sensitivity Analysis, held at Dubrovnik, Yugoslavia on August 31-September 5, 1964, sponsored by The Theory Committee of International Federation of Automatic Control. Sensitivity theory or sensitivity analysis concerns the solution of problems associated with parameter variations within the general scope of control theory. This book is organized into five parts encompassing 30 chapters. Part I presents some basic approaches of sensitivity analysis, such the Lyapunov's theory of stability, invariant imbedding, nonlinear sampled data, and linear time-varying systems. This part also looks into the preliminary steps towards the development of game theory and some general applications of sensitivity analysis. Part II treats the problem of accuracy, reliability, self-adjustment, and optimization of sensitivity of automatic control systems, while Part III deals with the functional derivative technique of sensitivity analysis and its applications for designing self-adjusting control systems. Part IV describes the task of synthesizing control systems for linear plants with variable parameters satisfying specified performance criteria. Part V considers the association between sensitivity and optimality in various control systems. This book will prove useful to design and other specialized fields in engineering.

System Identification Jan 11 2021 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.

Programming Embedded Systems Jun 23 2019 Authored by two of the leading authorities in the field, this guide offers readers the knowledge and skills needed to achieve proficiency with embedded software.

Delay Systems Nov 28 2019 This volume is the first of the new series Advances in Dynamics and Delays. It offers the latest advances in the research of analyzing and controlling dynamical systems with delays, which arise in many real-world problems. The contributions in this series are a collection across various disciplines, encompassing engineering, physics, biology, and economics, and some are extensions of those presented at the IFAC (International Federation of Automatic Control) conferences since 2011. The series is categorized in five parts covering the main themes of the contributions: · Stability Analysis and Control Design · Networks and Graphs · Time Delay and Sampled-Data Systems · Computational and Software Tools · Applications This volume will become a good reference point for researchers and PhD students in the field of delay systems, and for those willing to learn more about the field, and it will also be a resource for control engineers, who will find innovative control methodologies for relevant applications, from both theory and numerical analysis perspectives.

Identification and Robust Control of Linear Parameter-varying Systems May 27 2022

Rough Sets and Current Trends in Computing Dec 30 2019 This volume constitutes the refereed proceedings of the First International Conference on Rough Sets and Current Trends in Computing, RSCTC'98, held in Warsaw, Poland, in June 1998. The volume presents 82 revised papers carefully selected for inclusion in the proceedings; also included are five invited contributions. The volume is divided in topical sections on rough set methods, statistical inference, grammar systems and molecular computations, logic in rough sets, intelligent control, rough sets in knowledge discovery and data discovery, data mining, evolutionary computation, hybrid methods, etc..

Analysis of Linear Parameter Varying System Models Based on Reachable Sets Sep 26 2019 This paper presents the analysis method of quasi-LPV models, comparing the ellipsoid set which contains the reachable set of a nonlinear system to define which quasi-LPV model is less conservative to represent the nonlinear dynamics. Three quasi-LPV models are constructed from a nonlinear model using three different methods, to facilitate synthesis of an LPV controller for the nonlinear system. The comparison results of closed-loop system performance with synthesized LPV controllers correspond to the analysis results of quasi-LPV models.

Stability, Control, and Computation for Time-Delay Systems Jan 29 2020 Time delays are important components of many systems in, for instance, engineering, physics, economics, and the life sciences, because the transfer of material, energy, and information is usually not instantaneous. Time delays may appear as computation and communication lags, they model transport phenomena and heredity, and they arise as feedback delays in control loops. This monograph addresses the problem of stability analysis, stabilization, and robust fixed-order control of dynamical systems subject to delays, including both retarded- and neutral-type systems. Within the eigenvalue-based framework, an overall solution is given to the stability analysis, stabilization, and robust control design problem, using both analytical methods and numerical algorithms and applicable to a broad class of linear time-delay systems.? In this revised edition, the authors make the leap from stabilization to the design of robust and optimal controllers and from retarded-type to neutral-type delay systems, thus enlarging the scope of the book within control; include new, state-of-the-art material on numerical methods and algorithms to broaden the book?s focus and to reach additional research communities, in particular numerical linear algebra and numerical optimization; and increase the number and range of applications to better illustrate the effectiveness and generality of their approach.?

Fault Diagnosis for Linear Discrete Time-Varying Systems and Its Applications Sep 06 2020 This book focuses on fault diagnosis for linear discrete time-varying (LDTV) systems and its applications in modern engineering processes, with more weighting placed on the development of theory and methodologies. A comprehensive and systematic study on fault diagnosis for LDTV systems is provided, covering H∞-optimization-based fault diagnosis, H∞-filtering-based fault diagnosis, parity space-based fault diagnosis, Krein space technique-aided fault detection and fault estimation, and their typical applications in linear/nonlinear processes such as satellite attitude control systems and INS/GPS systems. This book benefits researchers, engineers, and graduate students in the fields of control engineering, electrical and electronic engineering, instrumentation science, and optoelectronic engineering.

Robust Control and Linear Parameter Varying Approaches Feb 21 2022 Vehicles are complex systems (non-linear, multi-variable) where the abundance of embedded controllers should ensure better security. This book aims at emphasizing the interest and potential of Linear Parameter Varying methods within the framework of vehicle dynamics, e.g. proposed control-oriented model, complex enough to handle some system non linearities but still simple for control or observer design, take into account the adaptability of the vehicle's response to driving situations, to the driver request and/or to the road sollicitations, manage interactions between various actuators to optimize the dynamic behavior of vehicles. This book results from the 32th International Summer School in Automatic that held in Grenoble, France, in September 2011, where recent methods (based on robust control and LPV technics), then applied to the control of vehicle dynamics, have been presented. After some theoretical background and a view on some recent works on LPV approaches (for modelling, analysis, control, observation and diagnosis), the main emphasis is put on road vehicles but some illustrations are concerned with railway, aerospace and underwater vehicles. The main objective of the book is to demonstrate the value of this approach for controlling the dynamic behavior of vehicles. It presents, in a rm way, background and new results on LPV methods and their application to vehicle dynamics.

Recursive Filtering for 2-D Shift-Varying Systems with Communication Constraints May 15 2021 This book presents up-to-date research developments and novel methodologies regarding recursive filtering for 2-D shift-varying systems with various communication constraints. It investigates recursive filter/estimator design and performance analysis by a combination of intensive stochastic analysis, recursive Riccati-like equations, variance-constrained approach, and mathematical induction. Each chapter considers dynamics of the system, subtle design of filter gains, and effects of the communication constraints on filtering performance. Effectiveness of the derived theories and applicability of the developed filtering strategies are illustrated via simulation examples and practical insight. Features:- Covers recent advances of recursive filtering for 2-D shift-varying systems subjected to communication constraints from the engineering perspective. Includes the recursive filter design, resilience operation and performance analysis for the considered 2-D shift-varying systems. Captures the essence of the design for 2-D recursive filters. Develops a series of latest results about the robust Kalman filtering and protocol-based filtering. Analyzes recursive filter design and filtering performance for the considered systems. This book aims at graduate students and researchers in mechanical engineering, industrial engineering, communications networks, applied mathematics, robotics and control systems.

Elements of Applied Bifurcation Theory Mar 01 2020 Providing readers with a solid basis in dynamical systems theory, as well as explicit procedures for application of general mathematical results to particular problems, the focus here is on efficient numerical implementations of the developed techniques. The book is designed for advanced undergraduates or graduates in applied mathematics, as well as for Ph.D. students and researchers in physics, biology, engineering, and economics who use dynamical systems as model tools in their studies. A moderate mathematical background is assumed, and, whenever possible, only elementary mathematical tools are used. This new edition preserves the structure of the first while updating the context to incorporate recent theoretical developments, in particular new and improved numerical methods for bifurcation analysis.

Model Predictive Control in the Process Industry Feb 09 2021 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.

Diagnosis and Fault-tolerant Control Volume 2 Jul 17 2021 This book presents recent advances in fault diagnosis and fault-tolerant control of dynamic processes. Its impetus derives from the need for an overview of the challenges of the fault diagnosis technique and sustainable control, especially for those demanding systems that require reliability, availability, maintainability, and safety to ensure efficient operations. Moreover, the need for a high degree of tolerance with respect to possible faults represents a further key point, primarily for complex systems, as modeling and control are inherently challenging, and maintenance is both expensive and safety-critical. Diagnosis and Fault-tolerant Control 2 also presents and compares different fault diagnosis and fault-tolerant schemes, using well established, innovative strategies for modeling the behavior of the dynamic process under investigation. An updated treatise of diagnosis and fault-tolerant control is addressed with the use of essential and advanced methods including signal-based, model-based and data-driven techniques. Another key feature is the application of these methods for dealing with robustness and reliability.

Applied Nonlinear Control Oct 27 2019 In this work, the authors present a global perspective on the methods available for analysis and design of non-linear control systems and detail specific applications. They provide a tutorial exposition of the major non-linear systems analysis techniques followed by a discussion of available non-linear design methods.

Nonlinear Control and Filtering for Stochastic Networked Systems Oct 08 2020 In this book, control and filtering problems for several classes of stochastic networked systems are discussed. In each chapter, the stability, robustness, reliability, consensus performance, and/or disturbance attenuation levels are investigated within a unified theoretical framework. The aim is to derive the sufficient conditions such that the resulting systems achieve the prescribed design requirements despite all the network-induced phenomena. Further, novel notions such as randomly occurring sensor failures and consensus in probability are discussed. Finally, the theories/techniques developed are applied to emerging research areas. Key Features Unifies existing and emerging concepts concerning stochastic control/filtering and distributed control/filtering with an emphasis on a variety of network-induced complexities Includes concepts like randomly occurring sensor failures and consensus in probability (with respect to time-varying stochastic multi-agent systems) Exploits the recursive linear matrix inequality approach, completing the square method, Hamilton-Jacobi inequality approach, and parameter-dependent matrix inequality approach to handle the emerging mathematical/computational challenges Captures recent advances of theories, techniques, and applications of stochastic control as well as filtering from an engineering-oriented perspective Gives simulation examples in each chapter to reflect the engineering practice

Modeling and Identification of Linear Parameter-Varying Systems Sep 30 2022 Through the past 20 years, the framework of Linear Parameter-Varying (LPV) systems has become a promising system theoretical approach to h- dle the controlof mildly nonlinear and especially position dependent systems which are common in mechatronic applications and in the process ind- try. The birth of this system class was initiated by the need of engineers to achieve better performance for nonlinear and time-varying dynamics, c- mon in many industrial applications, than what the classical framework of Linear Time-Invariant (LTI) control can provide. However, it was also a p- mary goal to preserve simplicity and "re-use" the powerful LTI results by extending them to the LPV case. The progress continued according to this philosophy and LPV control has become a well established ?eld with many promising applications. Unfortunately, modeling of LPV systems, especially based on measured data (which is called system identi?cation) has seen a limited development sincethebirthoftheframework. Currentlythisbottleneck oftheLPVfra- work is halting the transfer of the LPV theory into industrial use. Without good models that ful?ll the expectations of the users and without the und- standing how these models correspond to the dynamics of the application, it is di?cult to design high performance LPV control solutions. This book aims to bridge the gap between modeling and control by investigating the fundamental questions of LPV modeling and identi?cation. It explores the missing details of the LPV system theory that have hindered the formu- tion of a well established identi?cation framework.