Sliding Mode Control

Adopting the Beat of Appearance: An Psychological Symphony within **Sliding Mode Control**

In a world consumed by monitors and the ceaseless chatter of instantaneous transmission, the melodic splendor and emotional symphony developed by the published word usually disappear into the back ground, eclipsed by the relentless noise and distractions that permeate our lives. However, located within the pages of **Sliding Mode Control** a marvelous literary treasure overflowing with fresh emotions, lies an immersive symphony waiting to be embraced. Crafted by a wonderful composer of language, that charming masterpiece conducts viewers on a mental journey, well unraveling the hidden tunes and profound influence resonating within each cautiously crafted phrase. Within the depths of the poignant examination, we will discover the book is key harmonies, analyze its enthralling publishing fashion, and submit ourselves to the profound resonance that echoes in the depths of readers souls.

Sliding Mode Control and Observation Yuri Shtessel 2013-06-01 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.

A Practical Approach to Robust Sliding Mode Control Bader Wady Juma 2010

Sliding Mode Control Using Novel Sliding Surfaces B. Bandyopadhyay 2009-09-23

AfterasurveypaperbyUtkininthe late1970s,slidingmodecontrolmeth- ologies emerged as an e?ective tool to tackle uncertainty and disturbances which are inevitable in most of

the practical systems. Sliding mode control is a particular class of variable structure control which was introduced by Emel'yanov and his colleagues. The design paradigms of sliding mode c- trol has now become a mature design technique for the design of robust c- troller of uncertain system. In sliding mode technique, the state trajectory of the system is constrained on a chosen manifold (or within some neighb- hood thereof) by an appropriatecontrolaction. This manifold is also called a switching surface or a sliding surface. During sliding mode, system dynamics is governed by the chosen manifold which results in a well celebrated inva- ance property towards certain classes of disturbance and model mismatches. The purpose of this monograph is to give a di?erent dimension to sl- ing surface design to achieve high performance of the system. Design of the switching surface is vital because the closed loop dynamics is governed by the parameters of the sliding surface. Therefore sliding surface should be - signed to meet the closed loop speci?cations. Many systems demand high performance with robustness. To address this issue of achieving high perf- mance with robustness, we propose nonlinear surfaces for di?erent classes of systems. The nonlinear surface is designed such that it changes the system's closed-loop damping ratio from its initial low value to a ?nal high value.

Sliding Mode Control Christopher Edwards 2011

Discrete-Time Higher Order Sliding Mode Nalin Kumar Sharma 2018-09-10 This monograph investigates the existence of higher order sliding mode in discrete-time systems and propounds a new concept of discrete-time higher order sliding mode. The authors propose a definition of discrete-time higher order sliding mode and a control law is designed by means of a concept for an uncertain linear-time invariant system, as well as the behavior of the closed-loop system is analyzed. Moreover, the book includes a

thorough treatment of the probabilistic and non-deterministic case, i.e. stochastic discrete-time higher order sliding mode. The target audience primarily comprises research experts in control theory but the book may also be beneficial for graduate students alike.

Sliding Mode Control C Edwards 1998-08-27 In the formation of any control problem there will be discrepancies between the actual plant and the mathematical model for controller design. Sliding mode control theory seeks to produce controllers to over some such mismatches. This text provides the reader with a grounding in sliding mode control and is appropriate for the graduate with a basic knowledge of classical control theory and some knowledge of state-space methods. From this basis, more advanced theoretical results are developed. Two industrial case studies, which present the results of sliding mode controller implementations, are used to illustrate the successful practical application theory.

Sliding Mode Control Hebertt Sira-Ramírez 2015-05-25 This monograph presents a novel method of sliding mode control for switch-regulated nonlinear systems. The Delta Sigma modulation approach allows one to implement a continuous control scheme using one or multiple, independent switches, thus effectively merging the available linear and nonlinear controller design techniques with sliding mode control. Sliding Mode Control: The Delta-Sigma Modulation Approach, combines rigorous mathematical derivation of the unique features of Sliding Mode Control and Delta-Sigma modulation with numerous illustrative examples from diverse areas of engineering. In addition, engineering case studies demonstrate the applicability of the technique and the ease with which one can implement the exposed results. This book will appeal to researchers in control engineering and can be used as graduate-level textbook for a first course on sliding mode

control.

Advanced and Optimization Based Sliding Mode Control: Theory and Applications

Antonella Ferrara 2019-07-01 A compendium of the authors recently published results, this book discusses sliding mode control of uncertain nonlinear systems, with a particular emphasis on advanced and optimization based algorithms. The authors survey classical sliding mode control theory and introduce four new methods of advanced sliding mode control. They analyze classical theory and advanced algorithms, with numerical results complementing the theoretical treatment. Case studies examine applications of the algorithms to complex robotics and power grid problems. Advanced and Optimization Based Sliding Mode Control: Theory and Applications is the first book to systematize the theory of optimization based higher order sliding mode control and illustrate advanced algorithms and their applications to real problems. It presents systematic treatment of event-triggered and model based event-triggered sliding mode control schemes, including schemes in combination with model predictive control, and presents adaptive algorithms as well as algorithms capable of dealing with state and input constraints. Additionally, the book includes simulations and experimental results obtained by applying the presented control strategies to real complex systems. This book is suitable for students and researchers interested in control theory. It will also be attractive to practitioners interested in implementing the illustrated strategies. It is accessible to anyone with a basic knowledge of control engineering, process physics, and applied mathematics.

Applications of Sliding Mode Control in Science and Engineering

Sundarapandian Vaidyanathan 2017-04-06 Gathering 20 chapters contributed by respected experts, this book reports on the latest advances in and applications of sliding

mode control in science and engineering. The respective chapters address applications of sliding mode control in the broad areas of chaos theory, robotics, electrical engineering, physics, chemical engineering, memristors, mechanical engineering, environmental engineering, finance, and biology. Special emphasis has been given to papers that offer practical solutions, and which examine design and modeling involving new types of sliding mode control such as higher order sliding mode control, terminal sliding mode control, super-twisting sliding mode control, and integral sliding mode control. This book serves as a unique reference guide to sliding mode control and its recent applications for graduate students and researchers with a basic knowledge of electrical and control systems engineering.

Road Map for Sliding Mode Control Design Vadim Utkin 2020-04-14 This book is devoted to control of finite and infinite dimensional processes with continuous-time and discrete time control, focusing on suppression problems and new methods of adaptation applicable for systems with sliding motions only. Special mathematical methods are needed for all the listed control tasks. These methods are addressed in the initial chapters, with coverage of the definition of the multidimensional sliding modes, the derivation of the differential equations of those motions, and the existence conditions. Subsequent chapters discusses various areas of further research. The book reflects the consensus view of the authors regarding the current status of SMC theory. It is addressed to a broad spectrum of engineers and theoreticians working in diverse areas of control theory and applications. It is well suited for use in graduate and postgraduate courses in such university programs as Electrical Engineering, Control of Nonlinear Systems, and Mechanical Engineering.

Sliding Modes after the first

Decade of the 21st Century Leonid Fridman 2011-09-10 The book presents the newest results of the major world research groups working in the area of Variable Structure Systems and Sliding Mode Control (VSS/SMC). The research activity of these groups is coordinated by the IEEE Technical Committee on Variable Structure Systems (VSS) and Sliding Modes (SM). The presented results include the reports of the research groups collaborating in a framework of the Unión European Union – México project of Fondo de Cooperación Internacional en Ciencia y Tecnología (FONCICyT) 93302 titled "Automatization and Monitoring of Energy Production Processes via Sliding Mode Control". The book starts with the overview of the sliding mode control concepts and algorithms that were developed and discussed in the last two decades The research papers are combined in three sections: Part I: VSS and SM Algorithms and their Analysis Part II: SMC Design Part III: Applications of VSS and SMC The book will be of interests of engineers, researchers and graduate students working in the area of the control systems design. Novel mathematical theories and engineering concepts of control systems are rigorously discussed and supported by numerous applications to practical tasks.

Advances in Sliding Mode Control B Bandyopadhyay 2013-03-15 The sliding mode control paradigm has become a mature technique for the design of robust controllers for a wide class of systems including nonlinear, uncertain and time-delayed systems. This book is a collection of plenary and invited talks delivered at the 12th IEEE International Workshop on Variable Structure System held at the Indian Institute of Technology, Mumbai, India in January 2012. After the workshop, these researchers were invited to develop book chapters for this edited collection in order to reflect the latest results and

open research questions in the area. The contributed chapters have been organized by the editors to reflect the various themes of sliding mode control which are the current areas of theoretical research and applications focus; namely articulation of the fundamental underpinning theory of the sliding mode design paradigm, sliding modes for decentralized system representations, control of time-delay systems, the higher order sliding mode concept, results applicable to nonlinear and underactuated systems, sliding mode observers, discrete sliding mode control together with cutting edge research contributions in the application of the sliding mode concept to real world problems. This book provides the reader with a clear and complete picture of the current trends in Variable Structure Systems and Sliding Mode Control Theory.

Recent Developments in Sliding Mode Control Andrzej Bartoszewicz 2017-06-28 The main purpose of control engineering is to steer the regulated plant in such a way that it operates in a required manner. The desirable performance of the plant should be obtained despite the unpredictable influence of the environment on the control system and no matter if the plant parameters are precisely known. Even though the parameters may change with time and load, still the system should preserve its nominal properties and ensure the required behavior of the plant. In other words, the principal objective of control engineering is to design systems that are robust with respect to external disturbances and modeling uncertainty. This objective may be very well achieved using the sliding mode technique, which is the subject of this book.

Time-Varying Sliding Modes for Second and Third Order Systems Andrzej Bartoszewicz 2009-04-03 A principal objective of control engineering is to design control systems which are robust with respect to external disturbances and modelling

uncertainty. This objective may be well achieved using the sliding mode technique - which is the main subject of this monograph. More precisely, “Time-Varying Sliding Modes for Second and Third Order Systems” focuses on only one, but very important aspect of the sliding mode system design, i.e. the problem of the sliding plane selection. In this self-contained monograph, the main notions and concepts used in the field of variable structure systems and sliding mode control are presented before in the main part the issue of the switching surface design is discussed. This is done by considering two standard plants, which are very often encountered in the control engineering practice: the second and the third order nonlinear and possibly time-varying systems.

Sliding Mode Control of Switching Power Converters Siew-Chong Tan 2018-09-03 Sliding Mode Control of Switching Power Converters: Techniques and Implementation is perhaps the first in-depth account of how sliding mode controllers can be practically engineered to optimize control of power converters. A complete understanding of this process is timely and necessary, as the electronics industry moves toward the use of renewable energy sources and widely varying loads that can be adequately supported only by power converters using nonlinear controllers. Of the various advanced control methods used to handle the complex requirements of power conversion systems, sliding mode control (SMC) has been most widely investigated and proved to be a more feasible alternative than fuzzy and adaptive control for existing and future power converters. Bridging the gap between power electronics and control theory, this book employs a top-down instructional approach to discuss traditional and modern SMC techniques. Covering everything from equations to analog implantation, it: Provides a comprehensive general

overview of SMC principles and methods Offers advanced readers a systematic exposition of the mathematical machineries and design principles relevant to construction of SMC, then introduces newer approaches Demonstrates the practical implementation and supporting design rules of SMC, based on analog circuits Promotes an appreciation of general nonlinear control by presenting it from a practical perspective and using familiar engineering terminology With specialized coverage of modeling and implementation that is useful to students and professionals in electrical and electronic engineering, this book clarifies SMC principles and their application to power converters. Making the material equally accessible to all readers, whether their background is in analog circuit design, power electronics, or control engineering, the authors—experienced researchers in their own right—elegantly and practically relate theory, application, and mathematical concepts and models to corresponding industrial targets.

Sliding Mode Control In Engineering Wilfrid Perruquetti 2002-01-29 Provides comprehensive coverage of the most recent developments in the theory of non-Archimedean pseudo-differential equations and its application to stochastics and mathematical physics--offering current methods of construction for stochastic processes in the field of p-adic numbers and related structures. Develops a new theory for parabolic equat

Emerging Trends in Sliding Mode Control Axaykumar Mehta 2020-12-21 This book compiles recent developments on sliding mode control theory and its applications. Each chapter presented in the book proposes new dimension in the sliding mode control theory such as higher order sliding mode control, event triggered sliding mode control, networked control, higher order discrete-time sliding mode control and sliding mode

control for multi-agent systems. Special emphasis has been given to practical solutions to design involving new types of sliding mode control. This book is a reference guide for graduate students and researchers working in the domain for designing sliding mode controllers. The book is also useful to professional engineers working in the field to design robust controllers for various applications.

Advanced Sliding Mode Control for Mechanical Systems Jinkun Liu 2012-09-07 "Advanced Sliding Mode Control for Mechanical Systems: Design, Analysis and MATLAB Simulation" takes readers through the basic concepts, covering the most recent research in sliding mode control. The book is written from the perspective of practical engineering and examines numerous classical sliding mode controllers, including continuous time sliding mode control, discrete time sliding mode control, fuzzy sliding mode control, neural sliding mode control, backstepping sliding mode control, dynamic sliding mode control, sliding mode control based on observer, terminal sliding mode control, sliding mode control for robot manipulators, and sliding mode control for aircraft. This book is intended for engineers and researchers working in the field of control. Dr. Jinkun Liu works at Beijing University of Aeronautics and Astronautics and Dr. Xinhua Wang works at the National University of Singapore.

Advances in Discrete-Time Sliding Mode Control Ahmadreza Argha 2018-06-14 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

Frequency-Shaped and Observer-Based Discrete-time Sliding Mode Control

Axaykumar Mehta 2015-01-05

It is well established that the sliding mode control strategy provides an effective and robust method of controlling the deterministic system due to its well-known invariance property to a class of bounded disturbance and parameter variations. Advances in microcomputer technologies have made digital control increasingly popular among the researchers worldwide. And that led to the study of discrete-time sliding mode control design and its implementation. This brief presents, a method for multi-rate frequency shaped sliding mode controller design based on switching and non-switching type of reaching law. In this approach, the frequency dependent compensator dynamics are introduced through a frequency-shaped sliding surface by assigning frequency dependent weighing matrices in a linear quadratic regulator (LQR) design procedure. In this way, the undesired high frequency

dynamics or certain frequency disturbance can be eliminated. The states are implicitly obtained by measuring the output at a faster rate than the control. It is also known that the vibration control of smart structure is a challenging problem as it has several vibratory modes. So, the frequency shaping approach is used to suppress the frequency dynamics excited during sliding mode in smart structure. The frequency content of the optimal sliding mode is shaped by using a frequency dependent compensator, such that a higher gain can be obtained at the resonance frequencies. The brief discusses the design methods of the controllers based on the proposed approach for the vibration suppression of the intelligent structure. The brief also presents a design of discrete-time reduced order observer using the duality to discrete-time sliding surface design. First, the duality between the coefficients of the discrete-time reduced order observer and the sliding surface design is established and then, the design method for the observer using Riccati equation is explained. Using the proposed method, the observer for the Power System Stabilizer (PSS) for Single Machine Infinite Bus (SMIB) system is designed and the simulation is carried out using the observed states. The discrete-time sliding mode controller based on the proposed reduced order observer design method is also obtained for a laboratory experimental servo system and verified with the experimental results.

Protocol-Based Sliding Mode Control Jun Song 2022-09-14 This book discusses the Sliding Mode Control (SMC) problems of networked control systems (NCSs) under various communication protocols including static/dynamic/periodic event-triggered mechanism, and stochastic communication, Round-Robin, weighted try-once-discard, multiple-packet transmission, and the redundant channel

transmission protocol. The super-twisting algorithm and the extended-state-observer-based SMC scheme are described in this book for suppressing chattering. Besides, the SMC designs for two-dimensional (1-D) and two-dimensional (2-D) NCSs are illustrated as well. Features: Captures recent advances of theories, techniques, and applications of networked sliding mode control from an engineering-oriented perspective. Includes new design ideas and optimization techniques of networked sliding mode control theory. Provides advanced tools to apply networked sliding mode control techniques in the practical applications. Discusses some new tools to the engineering applications while dealing with the model uncertainties and external disturbances. This book aims at Researchers and professionals in Control Systems, Computer Networks, Internet of Things, and Communication Systems.

Sliding Mode Control for Synchronous Electric Drives Sergey E. Ryvkin 2011-11-21 This volume presents the theory of control systems with sliding mode applied to electrical motors and power converters. It demonstrates the methodology of control design and the original algorithms of control and observation. Practically all semiconductor devices are used in power converters, that feed electrical motors, as power switches. A switch

Sliding Modes in Control and Optimization Vadim I. Utkin 2013-03-12 The book is devoted to systems with discontinuous control. The study of discontinuous dynamic systems is a multifacet problem which embraces mathematical, control theoretic and application aspects. Times and again, this problem has been approached by mathematicians, physicists and engineers, each profession treating it from its own positions. Interestingly, the results obtained by specialists in different disciplines have almost always had a significant effect upon the development of

the control theory. It suffices to mention works on the theory of oscillations of discontinuous nonlinear systems, mathematical studies in ordinary differential equations with discontinuous righthand parts or variational problems in nonclassic statements. The unremitting interest to discontinuous control systems enhanced by their effective application to solution of problems most diverse in their physical nature and functional purpose is, in the author's opinion, a cogent argument in favour of the importance of this area of studies. It seems a useful effort to consider, from a control theoretic viewpoint, the mathematical and application aspects of the theory of discontinuous dynamic systems and determine their place within the scope of the present-day control theory. The first attempt was made by the author in 1975-1976 in his course on "The Theory of Discontinuous Dynamic Systems" and "The Theory of Variable Structure Systems" read to post-graduates at the University of Illinois, USA, and then presented in 1978-1979 at the seminars held in the Laboratory of Systems with Discontinous Control at the Institute of Control Sciences in Moscow.

Recent Trends in Sliding Mode Control Leonid Fridman 2016-04-28 This book describes recent advances in the theory, properties, methods and applications of SMC, including a discussion about the advantages and disadvantages of different SMC algorithms.

Sliding Mode Control Methodology in the Applications of Industrial Power Systems Jianxing Liu 2019-10-23 This book presents recent advanced techniques in sliding mode control and observer design for industrial power systems, focusing on their applications in polymer electrolyte membrane fuel cells and power converters. Readers will find not only valuable new fault detection and isolation techniques based on sliding mode control and observers, but also a number of robust control and estimation

methodologies combined with fuzzy neural networks and extended state observer methods. The book also provides necessary experimental and simulation examples for proton exchange membrane fuel cell systems and power converter systems. Given its scope, it offers a valuable resource for undergraduate and graduate students, academics, scientists and engineers who are working in the field.

Sliding Mode Control in Electro-Mechanical Systems Vadim Utkin 2017-12-19 Apply Sliding Mode Theory to Solve Control Problems Interest in SMC has grown rapidly since the first edition of this book was published. This second edition includes new results that have been achieved in SMC throughout the past decade relating to both control design methodology and applications. In that time, Sliding Mode Control (SMC) has continued to gain increasing importance as a universal design tool for the robust control of linear and nonlinear electro-mechanical systems. Its strengths result from its simple, flexible, and highly cost-effective approach to design and implementation. Most importantly, SMC promotes inherent order reduction and allows for the direct incorporation of robustness against system uncertainties and disturbances. These qualities lead to dramatic improvements in stability and help enable the design of high-performance control systems at low cost. Written by three of the most respected experts in the field, including one of its originators, this updated edition of Sliding Mode Control in Electro-Mechanical Systems reflects developments in the field over the past decade. It builds on the solid fundamentals presented in the first edition to promote a deeper understanding of the conventional SMC methodology, and it examines new design principles in order to broaden the application potential of SMC. SMC is particularly useful for the

design of electromechanical systems because of its discontinuous structure. In fact, where the hardware of many electromechanical systems (such as electric motors) prescribes discontinuous inputs, SMC becomes the natural choice for direct implementation. This book provides a unique combination of theory, implementation issues, and examples of real-life applications reflective of the authors' own industry-leading work in the development of robotics, automobiles, and other technological breakthroughs.

Discrete-time Sliding Mode Control B. Bandyopadhyay 2005-10-17 Sliding mode control is a simple and yet robust control technique, where the system states are made to confine to a selected subset. With the increasing use of computers and discrete-time samplers in controller implementation in the recent past, discrete-time systems and computer based control have become important topics. This monograph presents an output feedback sliding mode control philosophy which can be applied to almost all controllable and observable systems, while at the same time being simple enough as not to tax the computer too much. It is shown that the solution can be found in the synergy of the multirate output sampling concept and the concept of discrete-time sliding mode control.

Advances in Variable Structure and Sliding Mode Control Christopher Edwards 2006-07-25 Many of the chapters in this book are based on expansions of selected presentations from the 8th IEEE International Workshop on Variable Structure Systems VSS'04, which was held in Barcelona, Spain in September 2004. The editors have tried to identify the key contributions from this workshop, which define the state-of-the-art, represent new directions building on existing work, and highlight new emerging application areas.

Discrete-time Sliding Mode

Control B. Bandyopadhyay 2009-09-02 Sliding mode control is a simple and yet robust control technique, where the system states are made to confine to a selected subset. With the increasing use of computers and discrete-time samplers in controller implementation in the recent past, discrete-time systems and computer based control have become important topics. This monograph presents an output feedback sliding mode control philosophy which can be applied to almost all controllable and observable systems, while at the same time being simple enough as not to tax the computer too much. It is shown that the solution can be found in the synergy of the multirate output sampling concept and the concept of discrete-time sliding mode control.

Recent Developments in Sliding Mode Control Theory and Applications 19??

Recent Advances in Sliding Modes: From Control to Intelligent Mechatronics Xinghuo Yu 2015-04-10 This volume is dedicated to Professor Okyay Kaynak to commemorate his life time impactful research and scholarly achievements and outstanding services to profession. The 21 invited chapters have been written by leading researchers who, in the past, have had association with Professor Kaynak as either his students and associates or colleagues and collaborators. The focal theme of the volume is the Sliding Modes covering a broad scope of topics from theoretical investigations to their significant applications from Control to Intelligent Mechatronics.

Sliding Mode Control Using MATLAB Jinkun Liu 2017-05-25 Sliding Mode Control Using MATLAB provides many sliding mode controller design examples, along with simulation examples and MATLAB® programs. Following the review of sliding mode control, the book includes sliding mode control for continuous systems, robust adaptive sliding mode control,

sliding mode control for underactuated systems, backstepping, and dynamic surface sliding mode control, sliding mode control based on filter and observer, sliding mode control for discrete systems, fuzzy sliding mode control, neural network sliding mode control, and sliding mode control for robot manipulators. The contents of each chapter are independent, providing readers with information they can use for their own needs. It is suitable for the readers who work on mechanical and electronic engineering, electrical automation engineering, etc., and can also be used as a teaching reference for universities. Provides many sliding mode controller design examples to help readers solve their research and design problems Includes various, implementable, robust sliding mode control design solutions from engineering applications Provides the simulation examples and MATLAB programs for each sliding mode control algorithm

Adaptive Sliding Mode Neural Network Control for Nonlinear Systems Yang Li 2018-11-16 Adaptive Sliding Mode Neural Network Control for Nonlinear Systems introduces nonlinear systems basic knowledge, analysis and control methods, and applications in various fields. It offers instructive examples and simulations, along with the source codes, and provides the basic architecture of control science and engineering. Introduces nonlinear systems' basic knowledge, analysis and control methods, along with applications in various fields Offers instructive examples and simulations, including source codes Provides the basic architecture of control science and engineering

Variable-Structure Systems and Sliding-Mode Control Martin Steinberger 2020-02-10 The book covers the latest theoretical results and sophisticated applications in the field of variable-structure systems and sliding-mode control. This book is divided into four parts. Part I discusses

new higher-order sliding-mode algorithms, including new homogeneous controllers and differentiators. Part II then explores properties of continuous sliding-mode algorithms, such as saturated feedback control, reaching time, and orbital stability. Part III is focused on the usage of variable-structure systems (VSS) controllers for solving other control problems, for example unmatched disturbances. Finally, Part IV discusses applications of VSS; these include applications within power electronics and vehicle platooning. Variable-structure Systems and Sliding-Mode Control will be of interest to academic researchers, students and practising engineers.

Modern Sliding Mode Control Theory Giorgio Bartolini 2008-04-24 This concise book covers modern sliding mode control theory. The authors identify key contributions defining the theoretical and applicative state-of-the-art of the sliding mode control theory and the most promising trends of the ongoing research activities.

Applications of Sliding Mode Control Nabil Derbel 2016-10-14 This book presents essential studies and applications in the context of sliding mode control, highlighting the latest findings from interdisciplinary theoretical studies, ranging from computational algorithm development to representative applications. Readers will learn how to easily tailor the techniques to accommodate their ad hoc applications. To make the content as accessible as possible, the book employs a clear route in each paper, moving from background to motivation, to quantitative development (equations), and lastly to case studies/illustrations/tutorials (simulations, experiences, curves, tables, etc.). Though primarily intended for graduate students, professors and researchers from related fields, the book will also benefit engineers and scientists from industry.

Discrete-Time Stochastic

Sliding Mode Control Using Functional Observation Satnesh Singh 2019-11-25 This book extrapolates many of the concepts that are well defined for discrete-time deterministic sliding-mode control for use with discrete-time stochastic systems. It details sliding-function designs for various categories of linear time-invariant systems and its application for control. The resulting sliding-mode control addresses robustness issues and the functional-observer approach reduces the observer order substantially. Sliding-mode control (SMC) is designed for discrete-time stochastic systems, extended so that states lie within a specified band, and able to deal with incomplete information. Functional-observer-based SMC is designed for various clauses of stochastic systems: discrete-time; discrete-time with delay; state time-delayed; and those with parametric uncertainty. Stability considerations arising because of parametric uncertainty are taken into account and, where necessary, the effects of unmatched uncertainties mitigated. A simulation example is used to explain the use of the functional-observer approach to SMC design. Discrete-Time Stochastic Sliding-Mode Control Using Functional Observation will interest all researchers working in sliding-mode control and will be of particular assistance to graduate students in understanding the changes in design philosophy that arise when changing from continuous- to discrete-time systems. It helps to pave the way for further progress in applications of discrete-time SMC.

Advances and Applications in Sliding Mode Control systems Ahmad Taher Azar 2014-11-01 This book describes the advances and applications in Sliding mode control (SMC) which is widely used as a powerful method to tackle uncertain nonlinear systems. The book is organized into 21 chapters which have been organised by the editors to reflect the various themes of

sliding mode control. The book provides the reader with a broad range of material from first principles up to the current state of the art in the area of SMC and observation presented in a clear, matter-of-fact style. As such it is appropriate for graduate students with a basic knowledge of classical control theory and some knowledge of state-space methods and nonlinear systems. The resulting design procedures are emphasized using Matlab/Simulink software.

Sliding Mode Control of Vehicle Dynamics Antonella Ferrara 2017-08-16 The control of the longitudinal, lateral and vertical dynamics of two and four-wheeled vehicles, both of conventional type as well as fully-electric, is important not only for general safety of vehicular traffic in general, but also for future automated driving. This book provides an overview of this important topic.

Event-Triggered Sliding Mode Control Bijnan Bandyopadhyay 2018-02-20 This edited monograph provides a comprehensive and in-depth analysis of sliding mode control, focusing on event-triggered implementation. The technique allows to prefix the steady-state bounds of the system, and this is independent of any boundary disturbances. The idea of event-triggered SMC is developed for both single input / single output and multi-input / multi-output linear systems. Moreover, the reader learns how to apply this method to nonlinear systems. The book primarily addresses research experts in the field of sliding mode control, but the book may also be beneficial for graduate students.

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Table of Contents Sliding Mode Control

13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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