

Discrete Sliding Mode Control For Robust Tracking Of Time

Variable-Structure Systems and Sliding-Mode Control
 Advanced Computational Methods for Knowledge Engineering
 Advanced Sliding Mode Control for Mechanical Systems
 Concept, Theory and Implementation
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 Sliding Mode Control in Electro-Mechanical Systems
 Proceedings of KKA 2017—The 19th Polish Control Conference, Kraków, Poland, June 18-21, 2017
 Advances in Sliding Mode Control
 Output Sampling Based Sliding Mode Control for Discrete Time Systems
 Sliding Mode Control of Semi-Markovian Jump Systems
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 2018 22nd International Conference on System Theory, Control and Computing (ICSTCC)
 Recent Developments in Sliding Mode Control
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 2019 Chinese Control and Decision Conference (CCDC)
 Sliding Mode Control of Switching Power Converters
 October 10-12, 2018, Sinaia, România : Proceedings
 Continuous Versus Discrete Sliding Mode Control as Applied to a Pneumatic Positioning System
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Variable-Structure Systems and Sliding-Mode Control Springer

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.

Advanced Computational Methods for Knowledge Engineering CRC Press

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 classes 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.

Advanced Sliding Mode Control for Mechanical Systems SIAM

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 *Concept, Theory and Implementation* Springer

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 *Discrete-Time Stochastic Sliding Mode Control Using Functional Observation* CRC Press This unique book fulfils the definite need for an accessible book on variable structure systems and also provides the very latest results in research on this topic. Divided into three parts - basics of sliding mode control, new trends in sliding mode control, and applications of sliding mode control - the book contains many numerical design examples, so that readers can quickly understand the design methodologies and their applications to practical problems. Primarily aimed at students and researchers in the field, the book will also be useful for practising control engineers.

Variable Structure and Lyapunov Control Springer Nature

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

Theory and Application IET

This proceedings book contains 37 papers selected from the submissions to the 6th International Conference on Computer Science, Applied Mathematics and Applications (ICCSAMA 2019), which was held on 19–20 December, 2019, in Hanoi, Vietnam. The book covers theoretical and algorithmic as well as practical issues connected with several domains of Applied Mathematics and Computer Science, especially Optimization and Data Science. The content is divided into four major sections: Nonconvex Optimization, DC Programming & DCA, and Applications; Data Mining and Data Processing; Machine Learning Methods and Applications; and Knowledge Information and Engineering Systems. Researchers and practitioners in related areas will find a wealth of inspiring ideas and useful tools & techniques for their own work.

Discrete-time Sliding Mode Control Springer Nature

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

Techniques and Implementation CRC Press

The conference will provide a forum for discussions and presentations of advancements in knowledge, new methods and technologies relevant to industrial electronics, along with their applications and future developments *Emerging Trends in Sliding Mode Control* Discrete-time Sliding Mode Control A Multirate Output Feedback Approach

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.

Springer Nature

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 Using MATLAB Springer Science & Business Media

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.

Discrete Sliding Mode Control for Nonlinear Sampled Data Systems CRC Press

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.

Discrete Sliding Mode Control of Magnetic Bearings Springer Nature

After a survey paper by Utkin in the late 1970s, sliding mode control methodologies emerged as an effective 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 control has now become a mature design technique for the design of robust controller of uncertain system. In sliding mode technique, the state trajectory of the system is constrained on a chosen manifold (or within some neighborhood thereof) by an appropriate control action. 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 invariance property towards certain classes of disturbance and model mismatches. The purpose of this monograph is to give a different dimension to sliding 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 designed to meet the closed loop specifications. Many systems demand high performance with robustness. To address this issue of achieving high performance with robustness, we propose nonlinear surfaces for different 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 high value.

Active Control of Bidirectional Structural Vibration Springer Verlag

This book presents analysis and design for a class of stochastic systems with semi-Markovian jump parameters. It explores systematic analysis of semi-Markovian jump systems via sliding mode control strategy which makes up the shortages in the analysis and design of stochastic systems. This text provides a novel estimation method to deal with the stochastic stability of semi-Markovian jump systems along with design of novel integral sliding surface. Finally, Takagi-Sugeno fuzzy model approach is brought to deal with system nonlinearities and fuzzy sliding mode control laws are provided to ensure the stabilization purpose. Features: Presents systematic work on sliding mode control (SMC) of semi-Markovian jump systems. Explores SMC methods, such as fuzzy SMC, adaptive SMC, with the presence of generally uncertain transition rates. Provides novel method in dealing with stochastic systems with unknown switching information. Proposes more general theories for semi-Markovian jump systems with generally uncertain transition rates. Discusses practical examples to verify the effectiveness of SMC theory in semi-Markovian jump systems. This book aims at graduate and postgraduate students and for researchers in all engineering disciplines, including mechanical engineering, electrical engineering and applied mathematics, control engineering, signal processing, process control, control theory and robotics.

From Principles to Implementation Springer

This volume contains the proceedings of the KKA 2017 – the 19th Polish Control Conference, organized by the Department of Automatics and Biomedical Engineering, AGH University of Science and Technology in Kraków, Poland on June 18–21, 2017, under the auspices of the Committee on Automatic Control and Robotics of the Polish Academy of Sciences, and the Commission for Engineering Sciences of the Polish Academy of Arts and Sciences. Part 1 deals with general issues of modeling and control, notably flow modeling and control, sliding mode, predictive, dual, etc. control. In turn, Part 2 focuses on optimization, estimation and prediction for control. Part 3 is concerned with autonomous vehicles, while Part 4 addresses applications. Part 5 discusses computer methods in control, and Part 6 examines fractional order calculus in the modeling and control of dynamic systems. Part 7 focuses on modern robotics. Part 8 deals with modeling and identification, while Part 9 deals with problems related to security, fault detection and diagnostics. Part 10 explores intelligent systems in automatic control, and Part 11 discusses the use of control tools and techniques in biomedical engineering. Lastly, Part 12 considers engineering education and teaching with regard to automatic control and robotics.

Trends in Advanced Intelligent Control, Optimization and Automation CRC Press

This book presents novel algorithms for designing Discrete-Time Sliding Mode Controllers (DSMCs) for Networked Control Systems (NCSs) with both types of fractional delays namely deterministic delay and random delay along with different packet loss conditions such as single packet loss and multiple packet loss that occur within the sampling period. Firstly, the switching type and non-switching type algorithms developed for the deterministic type fractional delay where the delay is compensated using Thiran's approximation technique. A modified discrete-time sliding surface is

proposed to derive the discrete-time sliding mode control algorithms. The algorithm is further extended for the random fractional delay with single packet loss and multiple packet loss situations. The random fractional delay is modelled using Poisson's distribution function and packet loss is modelled by means of Bernoulli's function. The condition for closed loop stability in all above situations are derived using the Lyapunov function. Lastly, the efficacy of the proposed DSMC algorithms are demonstrated by extensive simulations and also experimentally validated on a servo system.

Theory and Applications Springer Science & Business Media

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 overcome 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. Discrete-Time Higher Order Sliding Mode CRC Press
Discrete-time Sliding Mode Control A Multirate Output Feedback Approach Springer Science & Business Media

Advanced and Optimization Based Sliding Mode Control: Theory and Applications IET

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.

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