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Discrete sliding mode control for robust tracking of time-delay systems

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Discrete Sliding Mode Control For Robust Tracking Of Time

**Tiago Roux Oliveira, Leonid
Fridman, Liu Hsu**



Discrete Sliding Mode Control For Robust Tracking Of Time:

Advances and Applications in Sliding Mode Control systems Ahmad Taher Azar, Quanmin Zhu, 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 Using Novel Sliding Surfaces** B. Bandyopadhyay, Fulwani Deepak, Kyung-Soo Kim, 2009-09-23 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 final high value **CONTROLO 2016** Paulo Garrido, Filomena Soares, António Paulo Moreira, 2016-09-03 The biennial CONTROLO conferences are the main events promoted by The CONTROLO 2016 12th Portuguese Conference on Automatic Control Guimarães Portugal September 14th to 16th was organized by Algoritmi School of Engineering University of Minho in partnership with INESC TEC and promoted by the Portuguese Association for Automatic Control APCA national member organization of the International Federation of Automatic Control IFAC The seventy five papers published in this volume cover a wide range of topics Thirty one of them of a more theoretical nature are distributed among the first five parts Control Theory Optimal and Predictive Control Fuzzy Neural and Genetic Control Modeling and Identification Sensing and Estimation The papers go from cutting edge theoretical research to innovative control applications and show expressively how Automatic Control can be used to increase the well

being of people the forty four papers of a more applied nature are presented in the following eight parts robotics mechatronics manufacturing systems and scheduling vibration control applications agricultural systems power applications general education go from cutting edge theoretical research to innovative control show expressively how automatic can be used increase well being people

Tracking Control of Networked Systems via Sliding-Mode Meng Li,Yong

Chen,Ikram Ali,2021-10-29 The book focuses on the research methods of networked control systems via sliding mode The problems with network disturbances network induced delay out of sequence and packet loss and network attacks are studied in detail The content studied in this book is introduced in detail and is verified by simulation or experiment It is especially suitable for readers who are interested in learning the control scheme of networked systems This book can benefit researchers engineers and students in related fields such as electrical control automation and cyber security

Advances in Discrete-Time Sliding Mode Control Ahmadreza Argha,Steven Su,Li Li,Hung Tan Nguyen,Branko George

Celler,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

Congestion Control in Data Transmission Networks Przemysław

Ignaciuk,Andrzej Bartoszewicz,2012-08-01 Congestion Control in Data Transmission Networks details the modeling and control of data traffic in communication networks It shows how various networking phenomena can be represented in a consistent mathematical framework suitable for rigorous formal analysis The monograph differentiates between fluid flow continuous time traffic models discrete time processes with constant sampling rates and sampled data systems with variable discretization periods The authors address a number of difficult real life problems such as optimal control of flows with disparate time varying delay the existence of source and channel nonlinearities the balancing of quality of service and fairness requirements and the incorporation of variable rate allocation policies Appropriate control mechanisms which can handle congestion and guarantee high throughput in various traffic scenarios with different networking phenomena being considered are proposed Systematic design procedures using sound control theoretic foundations are adopted Since

robustness issues are of major concern in providing efficient data flow regulation in today's networks sliding mode control is selected as the principal technique to be applied in creating the control solutions The controller derivation is given extensive analytical treatment and is supported with numerous realistic simulations A comparison with existing solutions is also provided The concepts applied are discussed in a number of illustrative examples and supported by many figures tables and graphs walking the reader through the ideas and introducing their relevance in real networks Academic researchers and graduate students working in computer networks and telecommunications and in control especially time delay systems and discrete time optimal and sliding mode control will find this text a valuable assistance in ensuring smooth data flow within communications networks

Proceedings of the 2009 International Conference on Signals, Systems and Automation (ICSSA 2009) Himanshu Soni, 2010-04-30 This book is a collection of papers from the 2009 International Conference on Signals Systems and Automation ICSSA 2009 The conference at a glance Pre conference Workshops Tutorials on 27th Dec 2009 Five Plenary talks Paper Poster Presentation 28 29 Dec 2009 Demonstrations by SKYVIEW Inc SLS Inc BSNL Baroda Electric Meters SIS On line paper submission facility on website 200 papers are received from India and abroad Delegates from different countries including Poland Iran USA Delegates from 16 states of India Conference website is seen by more than 3000 persons across the world 27 countries and 120 cities

Time-Varying Sliding Modes for Second and Third Order Systems Andrzej Bartoszewicz, Aleksandra Nowacka-Leverton, 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 Modes after the first Decade of the 21st Century Leonid Fridman, Jaime Moreno, Rafael Iriarte, 2011-09-28 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 Uni n European Union M xico project of Fondo de Cooperaci n Internacional en Ciencia y Tecnolog a 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 Issues in Robotics and Automation: 2013 Edition ,2013-05-01 Issues in Robotics and Automation 2013 Edition is a ScholarlyEditions book that delivers timely authoritative and comprehensive information about Computing Information and Control The editors have built Issues in Robotics and Automation 2013 Edition on the vast information databases of ScholarlyNews You can expect the information about Computing Information and Control in this book to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Robotics and Automation 2013 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

Proceedings of 4th 2024 International Conference on Autonomous Unmanned Systems (4th ICAUS 2024)

Lianqing Liu,Yifeng Niu,Wenxing Fu,Yi Qu,2025-04-24 This book includes original peer reviewed research papers from the 4th ICAUS 2024 which provides a unique and engaging platform for scientists engineers and practitioners from all over the world to present and share their most recent research results and innovative ideas The 4th ICAUS 2024 aims to stimulate researchers working in areas relevant to intelligent unmanned systems Topics covered include but are not limited to Unmanned Aerial Ground Surface Underwater Systems Robotic Autonomous Control Navigation and Positioning Architecture Energy and Task Planning and Effectiveness Evaluation Technologies Artificial Intelligence Algorithm Bionic Technology and their Application in Unmanned Systems The papers presented here share the latest findings in unmanned systems robotics automation intelligent systems control systems integrated networks modelling and simulation This makes the book a valuable resource for researchers engineers and students alike The 8th International Conference on Robotic, Vision, Signal Processing & Power Applications Harsa Amylia Mat Sakim,Mohd Tafir Mustaffa,2014-07-08 The proceeding is a collection of research papers presented at the 8th International Conference on Robotics Vision Signal Processing and Power Applications ROVISP 2013 by researchers scientists engineers academicians as well as industrial professionals from all around the globe The topics of interest are as follows but are not limited to Robotics Control Mechatronics and Automation Vision Image and Signal Processing Artificial Intelligence and Computer Applications Electronic Design and Applications Telecommunication Systems and Applications Power System and Industrial Applications Control Systems Theory with Engineering Applications Sergey E. Lyshevski,2012-12-06 Dynamics systems living organisms electromechanical and industrial systems chemical and technological processes market and ecology and so forth can be considered and analyzed using information and

systems theories For example adaptive human behavior can be studied using automatic feedback control As an illustrative example the driver controls a car changing the speed and steering wheels using incoming information such as traffic and road conditions This book focuses on the most important and manageable topics in applied multivariable control with application to a wide class of electromechanical dynamic systems A large spectrum of systems familiar to electrical mechanical and aerospace students engineers and scholars are thoroughly studied to build the bridge between theory and practice as well as to illustrate the practical application of control theory through illustrative examples It is the author's goal to write a book that can be used to teach undergraduate and graduate classes in automatic control and nonlinear control at electrical mechanical and aerospace engineering departments The book is also addressed to engineers and scholars and the examples considered allow one to implement the theory in a great variety of industrial systems The main purpose of this book is to help the reader grasp the nature and significance of multivariable control

Advances in Neural Networks -- ISSN 2011 Derong Liu, Huaguang Zhang, Marios Polycarpou, Cesare Alippi, Haibo He, 2011-05-20 The three volume set LNCS 6675 6676 and 6677 constitutes the refereed proceedings of the 8th International Symposium on Neural Networks ISSN 2011 held in Guilin China in May June 2011 The total of 215 papers presented in all three volumes were carefully reviewed and selected from 651 submissions The contributions are structured in topical sections on computational neuroscience and cognitive science neurodynamics and complex systems stability and convergence analysis neural network models supervised learning and unsupervised learning kernel methods and support vector machines mixture models and clustering visual perception and pattern recognition motion tracking and object recognition natural scene analysis and speech recognition neuromorphic hardware fuzzy neural networks and robotics multi agent systems and adaptive dynamic programming reinforcement learning and decision making action and motor control adaptive and hybrid intelligent systems neuroinformatics and bioinformatics information retrieval data mining and knowledge discovery and natural language processing

Nonlinear Stochastic Systems with Network-Induced Phenomena Jun Hu, Zidong Wang, Huijun Gao, 2014-07-21 This monograph introduces methods for handling filtering and control problems in nonlinear stochastic systems arising from network induced phenomena consequent on limited communication capacity Such phenomena include communication delay packet dropout signal quantization or saturation randomly occurring nonlinearities and randomly occurring uncertainties The text is self contained beginning with an introduction to nonlinear stochastic systems network induced phenomena and filtering and control moving through a collection of the latest research results which focuses on the three aspects of the state of the art of nonlinear filtering and control recent advances in recursive filtering and sliding mode control and their potential for application in networked control systems and concluding with some ideas for future research work New concepts such as the randomly occurring uncertainty and the probability constrained performance index are proposed to make the network models as realistic as possible The power of combinations of such recent tools as the

completing the square and sums of squares techniques Hamilton Jacobi Isaacs matrix inequalities difference linear matrix inequalities and parameter dependent matrix inequalities is exploited in treating the mathematical and computational challenges arising from nonlinearity and stochasticity Nonlinear Stochastic Systems with Network Induced Phenomena establishes a unified framework of control and filtering which will be of value to academic researchers in bringing structure to problems associated with an important class of networked system and offering new means of solving them The significance of the new concepts models and methods presented for practical control engineering and signal processing will also make it a valuable reference for engineers dealing with nonlinear control and filtering problems *Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems* Ligang Wu,Peng Shi,Xiaojie Su,2014-07-14 In control theory sliding mode control SMC is a nonlinear control method that alters the dynamics of a nonlinear system by application of a discontinuous control signal that forces the system to slide along a cross section of the system s normal behaviour In recent years SMC has been successfully applied to a wide variety of practical engineering systems including robot manipulators aircraft underwater vehicles spacecraft flexible space structures electrical motors power systems and automotive engines Sliding Mode Control of Uncertain Parameter Switching Hybrid Systems addresses the increasing demand for developing SMC technologies and comprehensively presents the new state of the art sliding mode control methodologies for uncertain parameter switching hybrid systems It establishes a unified framework for SMC of Markovian jump singular systems and proposes new SMC methodologies based on the analysis results A series of problems are solved with new approaches for analysis and synthesis of switched hybrid systems including stability analysis and stabilization dynamic output feedback control and SMC A set of newly developed techniques e g average dwell time piecewise Lyapunov function parameter dependent Lyapunov function cone complementary linearization are exploited to handle the emerging mathematical computational challenges Key features Covers new concepts new models and new methodologies with theoretical significance in system analysis and control synthesis Includes recent advances in Markovian jump systems switched hybrid systems singular systems stochastic systems and time delay systems Includes solved problems Introduces advanced techniques Sliding Mode Control of Uncertain Parameter Switching Hybrid Systems is a comprehensive reference for researchers and practitioners working in control engineering system sciences and applied mathematics and is also a useful source of information for senior undergraduate and graduates studying in these areas **Proceedings of the 2015 Chinese Intelligent Automation Conference** Zhidong Deng,Hongbo Li,2015-04-20 Proceedings of the 2015 Chinese Intelligent Automation Conference presents selected research papers from the CIAC 15 held in Fuzhou China The topics include adaptive control fuzzy control neural network based control knowledge based control hybrid intelligent control learning control evolutionary mechanism based control multi sensor integration failure diagnosis reconfigurable control etc Engineers and researchers from academia industry and the government can gain valuable insights into interdisciplinary solutions in the field of intelligent automation Women in

Power Jill S. Tietjen, Marija D. Ilic, Lina Bertling Tjernberg, Noel N. Schulz, 2023-07-18 This enlightening volume examines core areas of development in electric power systems emphasizing the pivotal contributions of women engineers to the industry's evolution. The authors cover a broad spectrum of key topics including generation technologies, transmission and distribution, progress, environmental challenges, worldwide electrification, and workforce issues. Advances in conventional and renewable energy technologies in parallel with growing environmental concerns and in conjunction with the aging of both the infrastructure itself and the workforce have led to imposing and fascinating challenges for the engineers of tomorrow. This book documents the critical role of women engineers and their pioneering discoveries, relates their stories of success and struggle in their own words, and shares their perspectives on how these challenges will be addressed in the decades ahead.

Sliding-Mode Control and Variable-Structure Systems Tiago Roux Oliveira, Leonid Fridman, Liu Hsu, 2023-10-31 This book reflects the latest developments in sliding mode control (SMC) and variable structure systems (VSS) comprising contributions by leading researchers and an international range of experts. Such contributions highlight advances in various branches of the field: conventional and higher order SMC with continuous and discrete time implementation and theory and applications both receive attention. The book consists of six parts. In the first new SMC VSS algorithms are proposed and their properties are analyzed. The second part focuses on the use of observers to solve the estimation and output feedback control problems. The third part discusses the discretization aspects of SMC algorithms. Parts IV and V provide important insights on the use of adaptation laws for non overestimated control gains and chattering alleviation. The last part examines the applications of these SMC VSS ideas to real world systems. Sliding Mode Control and Variable Structure Systems introduces postgraduates and researchers to the state of the art in the field. It includes theory, methods, and applications relevant to workers in disciplines including control, automation, applied mathematics, electrical and mechanical engineering, instrumentation, electronics, computer science, robotics, transportation, and power engineering. Its clear style and deep exposition help readers to keep in touch with tools that are thanks to the robustness and insensitivity to perturbations of the SMC VSS paradigm among the most efficient for dealing with uncertain systems.

Fuzzy Control, Estimation and Diagnosis Magdi S. Mahmoud, 2017-06-15 This textbook explains the principles of fuzzy systems in some depth together with information useful in realizing them within computational processes. The various algorithms and example problem solutions are a well balanced and pertinent aid for research projects, laboratory work, and graduate study. In addition to its worked examples, the book also uses end of chapter exercises as an instructional aid. The content of the book is developed and extended from material taught for four years in the author's classes. The text provides a broad overview of fuzzy control, estimation, and fault diagnosis. It ranges over various classes of target system and modes of control and then turns to filtering, stabilization, and fault detection and diagnosis. Applications, simulation tools, and an appendix on algebraic inequalities complete a unified approach to the analysis of single and interconnected fuzzy systems. Fuzzy Control, Estimation, and Fault

Detection is a guide for final year undergraduate and graduate students of electrical and mechanical engineering computer science and information technology and will also be instructive for professionals in the information technology sector

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