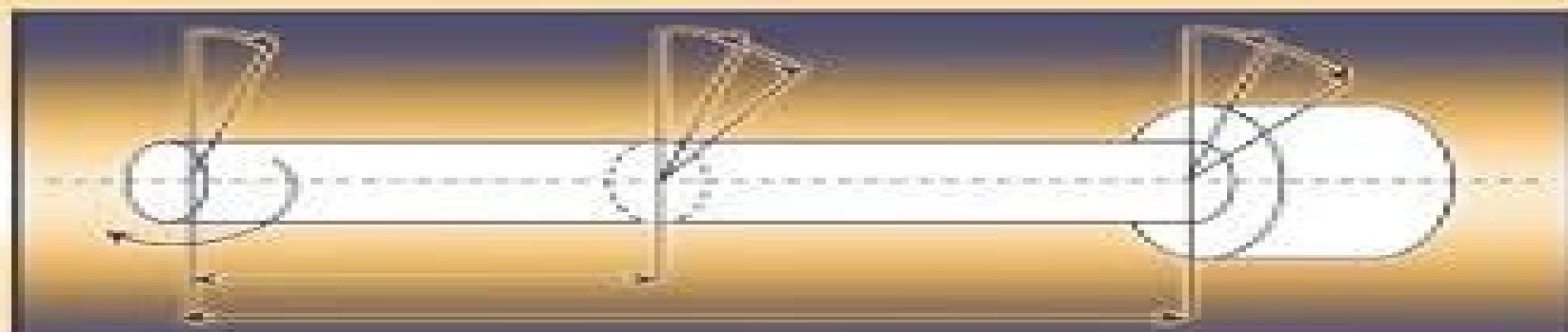


Automation and Control Engineering Series

Sliding Mode Control in Electro-Mechanical Systems

Second Edition



Vadim Utkin
Jürgen Guldner
Jingxin Shi



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Chunling Du,Lihua Xie



Sliding Mode Control In Electro Mechanical Systems Second Edition Automation And Control Engineering:

Sliding Mode Control in Electro-mechanical Systems Vadim Utkin, Juergen Guldner, Ma Shijun, 1999-04-22 Sliding Mode Control SMC is gaining increasing importance as a universal design tool for the robust control of linear and nonlinear systems The strengths of sliding mode controllers result from the ease and flexibility of the methodology for their design and implementation They provide inherent order reduction direct incorporation of robustness against system uncertainties and disturbances and an implicit stability proof They also allow for the design of high performance control systems at low costs SMC is particularly useful for electro mechanical systems because of its discontinuous structure In fact since the hardware of many electro mechanical systems such as electric motors prescribes discontinuous inputs SMC has become the natural choice for direct implementation The book is intended primarily for engineers and establishes an interdisciplinary bridge between control science electrical and mechanical engineering

Sliding Mode Control in Electro-Mechanical Systems Vadim Utkin, Juergen Guldner, Jingxin Shi, 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 Higher Order Sliding Mode Nalin Kumar Sharma, Janardhanan Sivaramakrishnan, 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 Synchronization and Control of Multiagent Systems Dong Sun,2018-10-09

Multiple intelligent agent systems are commonly used in research requiring complex behavior Synchronization control provides an advantage in solving the problem of multi agent coordination This book focuses on the use of synchronization control to coordinate the group behavior of multiple agents The author includes numerous real world applicatio

Handbook of Research on Advanced Mechatronic Systems and Intelligent Robotics Habib, Maki K.,2019-07-26 Advanced research in the field of mechatronics and robotics represents a unifying interdisciplinary and intelligent engineering science paradigm It is a holistic concurrent and interdisciplinary engineering science that identifies novel possibilities of synergizing and fusing different disciplines The Handbook of Research on Advanced Mechatronic Systems and Intelligent Robotics is a collection of innovative research on the methods and applications of knowledge in both theoretical and practical skills of intelligent robotics and mechatronics While highlighting topics including green technology machine learning and virtual manufacturing this book is ideally designed for researchers students engineers and computer practitioners seeking current research on developing innovative ideas for intelligent robotics and autonomous and smart interdisciplinary mechatronic products **End-to-End Adaptive Congestion Control in TCP/IP Networks** Christos N. Houmkozis,George A.

Rovithakis,2017-12-19 Establishing adaptive control as an alternative framework to design and analyze Internet congestion controllers End to End Adaptive Congestion Control in TCP IP Networks employs a rigorously mathematical approach coupled with a lucid writing style to provide extensive background and introductory material on dynamic systems stability and neural network approximation alongside future internet requests for congestion control architectures Designed to operate under extreme heterogeneous dynamic and time varying network conditions the developed controllers must also handle network modeling structural uncertainties and uncontrolled traffic flows acting as external perturbations The book also presents a parallel examination of specific adaptive congestion control NNRC using adaptive control and approximation theory as well as extensions toward cooperation of NNRC with application QoS control Features Uses adaptive control techniques for congestion control in packet switching networks Employs a rigorously mathematical approach with lucid writing style Presents simulation experiments illustrating significant operational aspects of the method including scalability dynamic behavior wireless networks and fairness Applies to networked applications in the music industry computers image trading and virtual groups by techniques such as peer to peer file sharing and internet telephony Contains working examples to highlight and clarify key attributes of the congestion control algorithms presented Drawing on the recent research efforts of the authors the book offers numerous tables and figures to increase clarity and summarize the algorithms that implement various NNRC building blocks Extensive simulations and comparison tests analyze its behavior and measure its performance

through monitoring vital network quality metrics Divided into three parts the book offers a review of computer networks and congestion control presents an adaptive congestion control framework as an alternative to optimization methods and provides appendices related to dynamic systems through universal neural network approximators *Lyapunov-Based Control of Robotic Systems* Aman Behal, Warren Dixon, Darren M. Dawson, Bin Xian, 2009-12-17 Lyapunov Based Control of Robotic Systems describes nonlinear control design solutions for problems that arise from robots required to interact with and manipulate their environments Since most practical scenarios require the design of nonlinear controllers to work around uncertainty and measurement related issues the authors use Lyapunov's direct method as an effective tool to design and analyze controllers for robotic systems After describing the evolution of real time control design systems and the associated operating environments and hardware platforms the book presents a host of standard control design tools for robotic systems using a common Lyapunov based framework It then discusses several problems in visual servoing control including the design of homography based visual servo control methods and the classic structure from motion problem The book also deals with the issues of path planning and control for manipulator arms and wheeled mobile robots With a focus on the emerging research area of human machine interaction the final chapter illustrates the design of control schemes based on passivity such that the machine is a net energy sink Including much of the authors own research work in controls and robotics this book facilitates an understanding of the application of Lyapunov based control design techniques to up and coming problems in robotics *Modeling and Control of Vibration in Mechanical Systems* Chunling Du, Lihua Xie, 2018-09-03 From the ox carts and pottery wheels the spacecrafts and disk drives efficiency and quality has always been dependent on the engineer's ability to anticipate and control the effects of vibration And while progress in negating the noise wear and inefficiency caused by vibration has been made more is needed Modeling and Control of Vibration in Mechanical Systems answers the essential needs of practitioners in systems and control with the most comprehensive resource available on the subject Written as a reference for those working in high precision systems this uniquely accessible volume Differentiates between kinds of vibration and their various characteristics and effects Offers a close up look at mechanical actuation systems that are achieving remarkably high precision positioning performance Includes techniques for rejecting vibrations of different frequency ranges Covers the theoretical developments and principles of control design with detail elaborate enough that readers will be able to apply the techniques with the help of MATLAB Details a wealth of practical working examples as well as a number of simulation and experimental results with comprehensive evaluations The modern world's ever growing spectra of sophisticated engineering systems such as hard disk drives aeronautic systems and manufacturing systems have little tolerance for unanticipated vibration of even the slightest magnitude Accordingly vibration control continues to draw intensive focus from top control engineers and modelers This resource demonstrates the remarkable results of that focus to date and most importantly gives today's researchers the technology that they need to build upon into the future Chunling Du

is currently researching modeling and advanced servo control of hard disk drives at the Data Storage Institute in Singapore Lihua Xie is the Director of the Centre for Intelligent Machines and a professor at Nanyang Technological University in Singapore System Modeling and Control with Resource-Oriented Petri Nets MengChu Zhou,Naiqi Wu,2018-09-03 Petri nets are widely used in modeling analysis and control of discrete event systems arising from manufacturing transportation computer and communication networks and web service systems However Petri net models for practical systems can be very large making it difficult to apply such models to real life problems System Modeling and Control with Resource Oriented Petri Nets introduces a new resource oriented Petri net ROPN model that was developed by the authors Not only does it successfully reduce model size but it also offers improvements that facilitate effective modeling analysis and control of automated and reconfigurable manufacturing systems Presenting the latest research in this novel approach this cutting edge volume provides proven theories and methodologies for implementing cost and time saving improvements to contemporary manufacturing systems It provides effective tools for deadlock avoidance deadlock free routing and deadlock free scheduling The authors supply simple and complex industrial manufacturing system examples to illustrate time tested concepts theories and approaches for solving real life application problems Written in a clear and concise manner the text covers applications to automated and reconfigurable manufacturing systems automated guided vehicle AGV systems semiconductor manufacturing systems and flexible assembly systems Explaining complex concepts in a manner that is easy to understand the authors provide the understanding and tools needed for more effective modeling analysis performance evaluation control and scheduling of engineering processes that will lead to more flexible and efficient manufacturing systems

Quantitative Process Control Theory Weidong Zhang,2011-12-02 This work explains how to solve industrial system problems using a novel control system design theory This easy to use theory does not require designers to choose a weighting function and enables the controllers to be designed or tuned for quantitative engineering performance indices such as overshoot Equally emphasizing theoretical and application aspects of the subject the book bridges classical control theory and the newly arriving generation of robust control theory It includes numerous exercises and examples drawn from aeronautical mechanical and chemical engineering

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