

Technische Universität München  
Lehrstuhl für Steuerungs- und Regelungstechnik

# Sliding Mode Control of Electromechanical Systems

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# Sliding Mode Control In Electromechanical Systems

**DP Hallahan**



## **Sliding Mode Control In Electromechanical Systems:**

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 of Electromechanical Systems Heide Brandstädter, 2009 *Sliding Mode Control of Electromechanical Systems* Heide Brandstädter, 2009 Advances in Neural Networks - ISNN 2007 Derong Liu, Shumin Fei, Zeng-Guang Hou, Huaguang Zhang, Changyin Sun, 2007-07-14 This book is part of a three volume set that constitutes the refereed proceedings of the 4th International Symposium on Neural Networks ISNN 2007 held in Nanjing China in June 2007 Coverage includes neural networks for control applications robotics data mining and feature extraction chaos and synchronization support vector machines fault diagnosis detection image video processing and applications of neural networks **Sliding Mode Control and Observation** Yuri Shtessel, Christopher Edwards, Leonid Fridman, Arie Levant, 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

*Sliding Mode Control (SMC)* David T. Ellis, 2015 Sliding mode control was first introduced in the 1950s It is a nonlinear control technique with many unique properties In this book different aspects of SMC are explored Chapters include new developments in research on a sliding mode governor for hydropower plants integral sliding mode control I SMC for a variable speed wind turbine system and a I SMC method for load frequency control LFC of nonlinear power systems with wind turbines the control of a stand alone photovoltaic PV system leader follower based formation control of a group of mobile robots the application of Takagi Sugeno T S fuzzy model in coordinated control of multiple robots system an induction motor speed control using the nonsingular terminal sliding mode control method adaptive nonsingular terminal sliding mode NTSM tracking control scheme based on backstepping design presented for Micro Electro Mechanical Systems MEMS vibratory gyroscopes and a hybrid actuator and its control using a cascade sliding mode technique Nonlinear Control Systems 2004 Frank Allgower, Michael Zeitz, 2005-02-02 Advances in Electrical Systems and Innovative Renewable Energy Techniques Mohamed Bendaoud, Amine El Fathi, Farhad Ilahi Bakhsh, Siano Pierluigi, 2024-04-03 This edited book on Advances in Electrical Systems and Innovative Renewable Energy Techniques is an outcome of the selected papers presented at the International Conference on Electrical Systems analytical and numerical methods for extraction of PV parameters extraction of maximum power from PV system using integral SMC strategy sun pointing orientation SuDoKu and ANN algorithms and fault detection and classification based on metaheuristic technique and feedforward neural network For the wind system its modeling is first discussed and then the control of the wind system using direct power PI fuzzy logic sliding mode and time delay strategies is analyzed In the third part the chapters focus on efficient energy management optimization of microgrids and the use of advanced technologies to improve energy performance Researchers present innovative solutions to address the challenges of energy efficiency grid responsiveness and the integration of new energy sources

**Instrument Engineers' Handbook, Volume Two** Bela G. Liptak, 2018-10-08 The latest update to Bela Liptak's acclaimed bible of instrument engineering is now available Retaining the format that made the previous editions bestsellers in their own right the fourth edition of Process Control and Optimization continues the tradition of providing quick and easy access to highly practical information The authors are practicing engineers not theoretical people from academia and their from the trenches advice has been repeatedly tested in real life applications Expanded coverage includes descriptions of overseas manufacturer's products and concepts model based optimization in control theory new major inventions and innovations in control valves and a full chapter devoted to safety With more than 2000 graphs figures and tables this all inclusive encyclopedic volume replaces an entire library with one authoritative reference The fourth edition brings the

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Blagovest Blagovest speaks on Post Oil Energy Technology on the AT T Tech Channel

Study of Application of Sliding Mode Control on CNC Machine Tools Masahiro Fujiki,2005 *Control and Mechatronics* Bodgan Wilamowski,J. David Irwin,2018-10-08 The Industrial Electronics Handbook Second Edition combines traditional and newer more specialized knowledge that will help industrial electronics engineers develop practical solutions for the design and implementation of high power applications Embracing the broad technological scope of the field this collection explores fundamental areas including analog and digital circuits electronics electromagnetic machines signal processing and industrial control and communications systems It also facilitates the use of intelligent systems such as neural networks fuzzy systems and evolutionary methods in terms of a hierarchical structure that makes factory control and supervision more efficient by addressing the needs of all production components Enhancing its value this fully updated collection presents research and global trends as published in the IEEE Transactions on Industrial Electronics Journal one of the largest and most respected publications in the field Control and Mechatronics presents concepts of control theory in a way that makes them easily understandable and practically useful for engineers or students working with control system applications Focusing more on practical applications than on mathematics this book avoids typical theorems and proofs and instead uses plain language and useful examples to Concentrate on control system analysis and design comparing various techniques Cover estimation observation and identification of the objects to be controlled to ensure accurate system models before production Explore the various aspects of robotics and mechatronics Other volumes in the set Fundamentals of Industrial Electronics Power Electronics and Motor Drives Industrial Communication Systems Intelligent Systems

**Variable Structure Systems** Asif Sabanovic,Leonid M. Fridman,Sarah K. Spurgeon,2004-10-08 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

Introduction to Hybrid Vehicle System Modeling and Control Wei Liu,2013-03-18 This is an engineering reference book on hybrid vehicle system analysis and design an outgrowth of the author s substantial work in research development and production at the National Research Council Canada Azure Dynamics and now General Motors It is an irreplaceable tool for helping engineers develop algorithms and gain a thorough understanding of hybrid vehicle systems This book covers all the major aspects of hybrid vehicle modeling control simulation performance analysis and preliminary design It not only systemically provides the basic knowledge of hybrid vehicle system configuration and main components but also details their characteristics and mathematic models Provides valuable technical

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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 ASME*

*Fluid Power Systems and Technology Division* ,2005 **Instruments, Measurement, Electronics and Information Engineering** J.Z. Ma,2013-08-08 Selected peer reviewed papers from the 2013 International Conference on Precision Mechanical Instruments and Measurement Technology ICPMIMT 2013 May 25 26 2013 Shenyang Liaoning China

*Intelligent Control and Automation* De-Shuang Huang,2006-08-04 Results of the International Conference on Intelligent Computing ICIC 2006 Lecture Notes in Computer Science LNCS Lecture Notes in Artificial Intelligence LNAI Lecture Notes in Bioinformatics LNBI Lecture Notes in Control and Information Sciences LNCIS 142 revised full papers are organized in topical sections Blind Source Separation Intelligent Sensor Networks Intelligent Control and Automation and Data Fusion

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