Nonlinear Adaptive Observer Based Sliding Mode Control For

This book systematically presents a comprehensive framework and effective techniques for in-depth analysis, clear design procedure, and efficient implementation of diagnosis and prognosis algorithms for hybrid systems. It offers an overview of the fundamentals of diagnosis and hybrid bond graph modeling. This book also describes hybrid bond graph-based quantitative fault detection, isolation and estimation. Moreover, it also presents strategies to track the system mode and predict the remaining useful life under multiple fault condition. A real world complex hybrid system—a vehicle steering control system—is studied using the developed fault diagnosis methods to show practical significance. Readers of this book will benefit from easy-to-understand fundamentals of bond graph models, concepts of health monitoring, fault diagnosis and failure prognosis, as well as hybrid systems. The reader will gain knowledge of fault detection and isolation in complex systems including those with hybrid nature, and will learn state-of-the-art developments in theory and technologies of fault diagnosis and failure prognosis for complex systems.

This book focuses on the fault diagnosis observer design for the switched system. Model-based fault diagnosis and fault tolerant control are one of the most popular research directions in recent decades. It contains eight chapters. Every chapter is independent in the method of observer design, but all chapters are around the same topic. Besides, in each chapter, the model description and theoretical results are firstly provided, then some practical application examples are illustrated to prove the obtained results. The advanced theoretical methodologies will benefit researchers or engineers in the area of safety engineering and the arrangement of the structure will help the readers to understand the content easily.

This book presents solutions to control problems in a number of robotic systems and provides a wealth of worked-out examples with full analytical and numerical details, graphically illustrated to aid in reader comprehension. It also presents relevant studies on and applications of robotic system control approaches, as well as the latest findings from interdisciplinary theoretical studies. Featuring chapters on advanced control (fuzzy, neural, backstepping, sliding mode, adaptive, predictive, diagnosis, and fault-tolerant control), the book will equip readers to easily tailor the techniques to their own applications. Accordingly, it offers a valuable resource for researchers, engineers, and students in the field of robotic...
get free nonlinear adaptive observer based sliding mode control for systems.

Fault Detection and Fault-tolerant Control Using Sliding Modes is the first text dedicated to showing the latest developments in the use of sliding-mode concepts for fault detection and isolation (FDI) and fault-tolerant control in dynamical engineering systems. It begins with an introduction to the basic concepts of sliding modes to provide a background to the field. This is followed by chapters that describe the use and design of sliding-mode observers for FDI using robust fault reconstruction. The development of a class of sliding-mode observers is described from first principles through to the latest schemes that circumvent minimum-phase and relative-degree conditions. Recent developments have shown that the field of fault tolerant control is a natural application of the well-known robustness properties of sliding-mode control. A family of sliding-mode control designs incorporating control allocation, which can deal with actuator failures directly by exploiting redundancy, is presented. Various realistic case studies, specifically highlighting aircraft systems and including results from the implementation of these designs on a motion flight simulator, are described. A reference and guide for researchers in fault detection and fault-tolerant control, this book will also be of interest to graduate students working with nonlinear systems and with sliding modes in particular. Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.

"Neural Network-Based State Estimation of Nonlinear Systems" presents efficient, easy to implement neural network schemes for state estimation, system identification, and fault detection and Isolation with mathematical proof of stability, experimental evaluation, and Robustness against unmolded dynamics, external disturbances, and measurement noises. This book studies selected discrete-time flight control schemes for fixed-wing unmanned aerial vehicle (UAV) systems in the presence of system uncertainties, external disturbances and input saturation. The main contributions of this book for UAV systems are as follows: (i) the proposed integer-order discrete-time control schemes are based on the designed discrete-time disturbance observers (DTDOs) and the neural network (NN); and (ii) the fractional-order discrete-time control schemes are developed by using the fractional-order calculus theory, the NN and the DTDOs. The book offers readers a good understanding of how to establish discrete-
Get Free Nonlinear Adaptive Observer Based Sliding Mode Control For time tracking control schemes for fixed-wing UAV systems subject to system uncertainties, external wind disturbances and input saturation. It represents a valuable reference guide for academic research on uncertain UAV systems, and can also support advanced / Ph.D. studies on control theory and engineering.

The governing equations of mathematical, chemical, biological, mechanical and economical models are often nonlinear and too complex to be solved analytically. Perturbation theory provides effective tools for obtaining approximate analytical solutions to a wide variety of such nonlinear problems, which may include differential or difference equations. In this book, we aim to present the recent developments and applications of the perturbation theory for treating problems in applied mathematics, physics and engineering. The eight chapters cover a variety of topics related to perturbation methods. The book is intended to draw attention of researchers and scientist in academia and industry.

A treatise on investigating tracking control and synchronization control of fractional-order nonlinear systems with system uncertainties, external disturbance, and input saturation. Robust Adaptive Control for Fractional-Order Systems, with Disturbance and Saturation provides the reader with a good understanding on how to achieve tracking control and synchronization control of fractional-order nonlinear systems with system uncertainties, external disturbance, and input saturation. Although some texts have touched upon control of fractional-order systems, the issues of input saturation and disturbances have rarely been considered together. This book offers chapter coverage of fractional calculus and fractional-order systems; fractional-order PID controller and fractional-order disturbance observer; design of fractional-order controllers for nonlinear chaotic systems and some applications; sliding mode control for fractional-order nonlinear systems based on disturbance observer; disturbance observer based neural control for an uncertain fractional-order rotational mechanical system; adaptive neural tracking control for uncertain fractional-order chaotic systems subject to input saturation and disturbance; stabilization control of continuous-time fractional positive systems based on disturbance observer; sliding mode synchronization control for fractional-order chaotic systems with disturbance; and more. Based on the approximation ability of the neural network (NN), the adaptive neural control schemes are reported for uncertain fractional-order nonlinear systems. Covers the disturbance estimation techniques that have been developed to alleviate the restriction faced by traditional feedforward control and reject the effect of external
disturbances for uncertain fractional-order nonlinear systems. By combining the NN with the disturbance observer, the disturbance observer based adaptive neural control schemes have been studied for uncertain fractional-order nonlinear systems with unknown disturbances. Considers, together, the issue of input saturation and the disturbance for the control of fractional-order nonlinear systems in the presence of system uncertainty, external disturbance, and input saturation. Robust Adaptive Control for Fractional-Order Systems, with Disturbance and Saturation can be used as a reference for the academic research on fractional-order nonlinear systems or used in Ph.D. study of control theory and engineering.

Fault Diagnosis of Nonlinear Systems Using a Hybrid Approach
Advanced Control Engineering Methods in Electrical Engineering Systems
Smart Civil Structures
Fractional Order Systems
Sliding Mode Control of Semi-Markovian Jump Systems

Neural Network-Based Adaptive Control of Uncertain Nonlinear Systems
Model-based Health Monitoring of Hybrid Systems
Volume 5: Advanced Transmission System and Driveline
In honor of Miroslav Krstic

Robust Observer-Based Fault Diagnosis for Nonlinear Systems Using MATLAB®Springer
In practice, actuators often undergo failures and various factors influence its effectiveness. Also due to the increasing complexity of large-scale systems, subsystems are often interconnected, whereas the interactions between any two subsystems are difficult to deal with. This book details a series of new methodologies of designing and analyzing adaptive backstepping control systems involving treatment on actuator failures, subsystem interactions and nonsmooth nonlinearities. Moreover, it discusses some interesting open issues in adaptive failure accommodation, decentralized adaptive control and distributed adaptive coordinated control.

Fault Diagnosis and Prognosis Techniques for Complex Engineering Systems gives a systematic description of the many facets of envisaging, designing, implementing, and experimentally exploring emerging trends in fault diagnosis and failure prognosis in mechanical, electrical, hydraulic and biomedical systems. The book is devoted to the development of mathematical methodologies for fault diagnosis and isolation, fault tolerant control, and failure prognosis problems of engineering systems. Sections present new techniques in reliability modeling, reliability analysis, reliability design, fault and failure detection, signal processing, and fault tolerant control of engineering systems. Sections focus on the development of mathematical methodologies for diagnosis and prognosis of faults or failures, providing a unified platform for understanding and applicability of advanced diagnosis and prognosis methodologies for improving reliability purposes in both theory and practice, such as vehicles, manufacturing systems, circuits, flights, biomedical systems. This book will be a valuable resource for
different groups of readers - mechanical engineers working on vehicle systems, electrical engineers working on rotary machinery systems, control engineers working on fault detection systems, mathematicians and physician working on complex dynamics, and many more. 

Presents recent advances of theory, technological aspects, and applications of advanced diagnosis and prognosis methodologies in engineering applications Provides a series of the latest results, including fault detection, isolation, fault tolerant control, failure prognosis of components, and more Gives numerical and simulation results in each chapter to reflect engineering practices

Many problems in decision making, monitoring, fault detection, and control require the knowledge of state variables and time-varying parameters that are not directly measured by sensors. In such situations, observers, or estimators, can be employed that use the measured input and output signals along with a dynamic model of the system in order to estimate the unknown states or parameters. An essential requirement in designing an observer is to guarantee the convergence of the estimates to the true values or at least to a small neighborhood around the true values. However, for nonlinear, large-scale, or time-varying systems, the design and tuning of an observer is generally complicated and involves large computational costs. This book provides a range of methods and tools to design observers for nonlinear systems represented by a special type of a dynamic nonlinear model -- the Takagi-Sugeno (TS) fuzzy model. The TS model is a convex combination of affine linear models, which facilitates its stability analysis and observer design by using effective algorithms based on Lyapunov functions and linear matrix inequalities. Takagi-Sugeno models are known to be universal approximators and, in addition, a broad class of nonlinear systems can be exactly represented as a TS system. Three particular structures of large-scale TS models are considered: cascaded systems, distributed systems, and systems affected by unknown disturbances. The reader will find in-depth theoretic analysis accompanied by illustrative examples and simulations of real-world systems. Stability analysis of TS fuzzy systems is addressed in detail.

The intended audience are graduate students and researchers both from academia and industry. For newcomers to the field, the book provides a concise introduction dynamic TS fuzzy models along with two methods to construct TS models for a given nonlinear system. Due to its abilities to compensate disturbances and uncertainties, disturbance observer based control (DOBC) is regarded as one of the most promising approaches for disturbance-attenuation. One of the first books on DOBC, Disturbance Observer Based Control: Methods and Applications presents novel theory results as well as best practices for applica

Fractional Order Systems: Optimization, Control, Circuit Realizations and Applications consists of 21 contributed chapters by subject experts. Chapters offer practical solutions and novel methods for recent research problems in the multidisciplinary applications of fractional order systems, such as FPGA, circuits, memristors, control algorithms, photovoltaic systems, robot manipulators, oscillators, etc. This book is ideal for researchers working in the modeling and applications of both continuous-time and discrete-time dynamics and chaotic systems. Researchers from academia and industry who are working in research areas such as control engineering, electrical engineering, mechanical engineering, computer science, and information technology will find the book most informative. Discusses multi-disciplinary applications with new fundamentals, modeling, analysis, design, realization and experimental results Includes new circuits and systems based on the new nonlinear elements Covers most of the linear and nonlinear fractional-order theorems that will solve many scientific issues for researchers Closes the gap between theoretical approaches and real-world applications Provides MATLAB® and Simulink code for many of the applications in the book

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.

New Trends in Observer-Based Control: An Introduction to Design Approaches and Engineering Applications, Volume One presents a clear-and-concise introduction to the latest advances in observer-based control design. It provides a comprehensive tutorial on new trends in the design of observer-based controllers for which the separation principle is well established. In addition, since the theoretical developments remain more advanced than the engineering applications, more experimental results are still needed. A wide range of applications are covered, and the book contains worked examples which make it ideal for both advanced courses and researchers starting in the field. Presents a clear-and-concise introduction to the latest advances in observer-based control design Offers concise content on the many facets of observer-based control design Discusses key applications in the fields of power systems, robotics and mechatronics, and flight and automotive systems.

Due to the increasing security and reliability demand of actual industrial process control systems, the study on fault diagnosis and fault tolerant control of dynamic systems has received considerable attention. Fault accommodation (FA) is one of effective methods that can be used to enhance system stability and reliability, so it has been widely and in-depth investigated and become a hot topic in recent years. Fault detection is used to monitor whether a fault occurs, which is the first step in FA. On the basis of fault detection, fault estimation (FE) is utilized to determine online the magnitude of the fault, which is a very important step because the additional controller is designed using the fault estimate. Compared with fault detection, the design difficulties of FE would increase a lot, so research on FE and accommodation is very challenging. Although there have been advancements reported...
on FE and accommodation for dynamic systems, the common methods at the present stage have design difficulties, which limit applications of respective design approaches. Therefore, the problems of FE and accommodation are needed to be further studied. This book considers the theory and technology of FE and accommodation for dynamic systems, and establishes a systemic and comprehensive framework of FE and accommodation for continuous/discrete-time systems.

Proceedings of the FISITA 2012 World Automotive Congress are selected from nearly 2,000 papers submitted to the 34th FISITA World Automotive Congress, which is held by Society of Automotive Engineers of China (SAE-China) and the International Federation of Automotive Engineering Societies (FISITA). This proceedings focus on solutions for sustainable mobility in all areas of passenger car, truck and bus transportation. Volume 5: Advanced Transmission System and Driveline focuses on: • Clutch System and Controls • Gear Systems and Driveline • Advanced Transmission System • Transmission Control System Above all researchers, professional engineers and graduates in fields of automotive engineering, mechanical engineering and electronic engineering will benefit from this book. SAE-China is a national academic organization composed of enterprises and professionals who focus on research, design and education in the fields of automotive and related industries. FISITA is the umbrella organization for the national automotive societies in 37 countries around the world. It was founded in Paris in 1948 with the purpose of bringing engineers from around the world together in a spirit of cooperation to share ideas and advance the technological development of the automobile.

The focus of this book is the application of artificial neural networks in uncertain dynamical systems. It explains how to use neural networks in concert with adaptive techniques for system identification, state estimation, and control problems. The authors begin with a brief historical overview of adaptive control, followed by a review of mathematical preliminaries. In the subsequent chapters, they present several neural network-based control schemes. Each chapter starts with a concise introduction to the problem under study, and a neural network-based control strategy is designed for the simplest case scenario. After these designs are discussed, different practical limitations (i.e., saturation constraints and unavailability of all system states) are gradually added, and other control schemes are developed based on the primary scenario. Through these exercises, the authors present structures that not only provide mathematical tools for navigating control problems, but also supply solutions that are pertinent to real-life systems. The present text aims at helping the reader to maximize the reuse of information. Topics covered include tools and services for creating simple, rich, and reusable knowledge representations to explore strategies for integrating this knowledge into legacy systems. The reuse and integration are essential concepts that must be enforced to avoid duplicating the effort and reinventing the wheel each time in the same field. This problem is investigated from different perspectives. in organizations, high volumes of data from different sources form a big threat for filtering out the information for effective decision making. the reader will be informed of the most recent advances in information reuse and integration.

Chaos and nonlinear dynamics initially developed as a new emergent field with its foundation in physics and applied mathematics. The highly generic, interdisciplinary quality of the insights gained in the last few decades has spawned myriad applications in almost all branches of science and technology—and even well beyond. Wherever quantitative modeling and analysis of complex, nonlinear phenomena is required, chaos theory and its methods can play a key role. This volume concentrates on reviewing the most relevant contemporary applications of chaotic nonlinear systems as they apply to the various cutting-edge branches of
Get Free Nonlinear Adaptive Observer Based Sliding Mode Control For engineering. The book covers the theory as applied to robotics, electronic and communication engineering (for example chaos synchronization and cryptography) as well as to civil and mechanical engineering, where its use in damage monitoring and control is explored. Featuring contributions from active and leading research groups, this collection is ideal both as a reference and as a ‘recipe book’ full of tried and tested, successful engineering applications. 

This book and its companion volumes, LNCS vols. 5551, 5552 and 5553, constitute the proceedings of the 6th International Symposium on Neural Networks (ISNN 2009), held during May 26–29, 2009 in Wuhan, China. Over the past few years, ISNN has matured into a well-estabished premier international symposium on neural n-works and related fields, with a successful sequence of ISNN symposia held in Dalian (2004), Chongqing (2005), Chengdu (2006), Nanjing (2007), and Beijing (2008). Following the tradition of the ISNN series, ISNN 2009 provided a high-level inter- tional forum for scientists, engineers, and educators to present state-of-the-art research in neural networks and related fields, and also to discuss with international colleagues on the major opportunities and challenges for future neural network research. Over the past decades, the neural network community has witnessed tremendous - fots and developments in all aspects of neural network research, including theoretical foundations, architectures and network organizations, modeling and simulation, - pirical study, as well as a wide range of applications across different domains. The recent developments of science and technology, including neuroscience, computer science, cognitive science, nano-technologies and engineering design, among others, have provided significant new understandings and technological solutions to move the neural network research toward the development of complex, large-scale, and n- worked brain- like intelligent systems. This long-term goal can only be achieved with the continuous efforts of the community to seriously investigate different issues of the neural networks and related fields. 

Dear delegates, friends and members of the growing KES professional community, we come to the proceedings of the 9th International Conference on Knowledge-Based and Intelligent Information and Engineering Systems hosted by La Trobe University in Melbourne Australia. The KES conference series has been established for almost a decade, and it cont- ues each year to attract participants from all geographical areas of the world, including Europe, the Americas, Australasia and the Paci?c Rim. The KES conferences cover a wide range of intelligent systems topics. The broad focus of the conference series is the theory and applications of intelligent systems. From a pure research ?eld, intelligent systems have advanced to the point where their abilities have been incorporated into many business and engineering application areas. KES 2005 provided a valuable mechanism for delegates to obtain an extensive view of the latest research into a range of intelligent-systems algorithms, tools and techniques. The conference also gave de- gates the chance to come into contact with those applying intelligent systems in diverse commercial areas. The combination of theory and practice represented a unique opp- tunity to gain an appreciation of the full spectrum of leading-edge intelligent-systems activity. The papers for KES 2005 were either submitted to invited sessions, chaired and organized by respected experts in their ?elds, or to a general session, managed by an extensive International Program Committee, or to the Intelligent Information Hiding and Multimedia Signal Processing (IIHMSP) Workshop, managed by an International Workshop Technical Committee. 

Focused on renewable energy systems and the development of information and communication technologies (ICTs) for their integration in smart grids, this book presents recent advances and methods that help to ensure that power generation from
Get Free Nonlinear Adaptive Observer Based Sliding Mode Control For renewable sources remains stable, that power losses are minimized, and that the reliable functioning of these power generation units is maintained. The book highlights key topics and technologies for renewable energy systems including the intelligent control of power generators, power electronics that connect renewable power generation units to the grid, and fault diagnosis for power generators and power electronics. In particular, the following topics are addressed: • Modeling and control of power generators (PMSGs, DFIGs); • Modeling and control of power electronics (converters, inverters); • Modeling and fault diagnosis of the transmission and distribution Grid; and • Modelling and control of distributed power generation units (interconnected synchronous generators or photovoltaic units). Because of the above coverage, members of the wider engineering community will find that the nonlinear control and estimation methods presented provide essential insights into the functioning of renewable energy power systems, while the academic community will find the book a valuable textbook for undergraduate or graduate courses on renewable energy systems.

Model-based Turbocharged Diesel Engine Control and Diagnostics Using Nonlinear Sliding Control and Observers
Robust Discrete-Time Flight Control of UAV with External Disturbances
Observer-Based Fault Estimation Techniques
Advances in Chaos Theory and Intelligent Control
Analysis and Design
Application to Fault Detection and Isolation
9th International Conference, KES 2005, Melbourne, Australia, September 14-16, 2005, Proceedings
Stability Analysis and Nonlinear Observer Design using Takagi-Sugeno Fuzzy Models
Adaptive Backstepping Control of Uncertain Systems with Actuator Failures, Subsystem Interactions, and Nonsmooth Nonlinearities
Variable Structure Control of Complex Systems

The increasing complexity of space vehicles such as satellites, and the cost reduction measures that have affected satellite operators are increasingly driving the need for more autonomy in satellite diagnostics and control systems. Current methods for detecting and correcting anomalies onboard the spacecraft as well as on the ground are primarily manual and labor intensive, and therefore, tend to be slow. Operators inspect telemetry data to determine the current satellite health. They use various statistical techniques and models, but the analysis and evaluation of the large volume of data still require extensive human intervention and expertise that is prone to error. Furthermore, for spacecraft and most of these satellites, there can be potentially unduly long delays in round-trip communications between the ground station and the satellite. In this context, it is desirable to have onboard fault-diagnosis system that is capable of detecting, isolating, identifying or classifying faults in the system without the involvement and intervention of operators. Toward this end, the principle goal here is to improve the efficiency, accuracy, and reliability of the trend analysis and diagnostics techniques through utilization of intelligent-based and hybrid-based methodologies.
This book introduces several observer-based methods, including: • the sliding-mode observer • the adaptive observer • the unknown-input observer and • the descriptor observer method for the problem of fault detection, isolation and estimation, allowing readers to compare and contrast the different approaches. The authors present basic material on Lyapunov stability theory, H∞ control theory, sliding-mode control theory and linear matrix inequality problems in a self-contained and step-by-step manner. Detailed and rigorous mathematical proofs are provided for all the results developed in the text so that readers can quickly gain a good understanding of the material. MATLAB® and Simulink® codes for all the examples, which can be downloaded from http://extras.springer.com, enable students to follow the methods and illustrative examples easily. The systems used in the examples make the book highly relevant to real-world problems in industrial control engineering and include a seventh-order aircraft model, a single-link flexible joint robot arm and a satellite controller. To help readers quickly find the information they need and to improve readability, the individual chapters are written so as to be semi-independent of each other. Robust Observer-Based Fault Diagnosis for Nonlinear Systems Using MATLAB® is of interest to process, aerospace, robotics and control engineers, engineering students and researchers with a control engineering background. Guaranteeing a high system performance over a wide operating range is an important issue surrounding the design of automatic control systems with successively increasing complexity. As a key technology in the search for a solution, advanced fault detection and identification (FDI) is receiving considerable attention. This book introduces basic model-based FDI schemes, advanced analysis and design algorithms, and mathematical and control-theoretic tools. This second edition of Model-Based Fault Diagnosis Techniques contains: • new material on fault isolation and identification and alarm management; • extended and revised treatment of systematic threshold determination for systems with both deterministic unknown inputs and stochastic noises; • addition of the continuously-stirred tank heater as a representative process-industrial benchmark; and • enhanced discussion of residual evaluation which now deals with stochastic processes. Model-based Fault Diagnosis Techniques will interest academic researchers working in fault identification and diagnosis and as a text it is suitable for graduate students in a formal university-based course or as a self-study aid for practising engineers working with automatic control or mechatronic systems from backgrounds as diverse as chemical process and power engineering. This book investigates observer-fault estimation techniques in detail, while also highlighting recent research and findings regarding fault estimation. Many practical control systems are subject to possible malfunctions, which may cause significant performance loss or even system instability. To improve the reliability, performance and safety of dynamical systems, fault diagnosis techniques are now receiving considerable attention, both in research and applications, and have been the subject of intensive
investigations. Fault detection - the essential first step in fault diagnosis - is a binary decision-making process used to determine whether or not a fault has occurred. In turn, fault isolation is used to identify the location of the faulty component, while fault estimation is used to identify the size of the fault online. Compared with the problems involved in fault detection and isolation, fault estimation is considerably more challenging.

A trend of investigation of Nonlinear Control Systems has been present over the last few decades. As a result the methods for its analysis and design have improved rapidly. This book includes nonlinear design topics such as Feedback Linearization, Lyapunov Based Control, Adaptive Control, Optimal Control and Robust Control. All chapters discuss different applications that are basically independent of each other. The book will provide the reader with information on modern control techniques and results which cover a very wide application area. Each chapter attempts to demonstrate how one would apply these techniques to real-world systems through both simulations and experimental settings.

The book reports on the latest advances in and applications of chaos theory and intelligent control. Written by eminent scientists and active researchers and using a clear, matter-of-fact style, it covers advanced theories, methods, and applications in a variety of research areas, and explains key concepts in modeling, analysis, and control of chaotic and hyperchaotic systems. Topics include fractional chaotic systems, chaos control, chaos synchronization, memristors, jerk circuits, chaotic systems with hidden attractors, mechanical and biological chaos, and circuit realization of chaotic systems. The book further covers fuzzy logic controllers, evolutionary algorithms, swarm intelligence, and petri nets among other topics. Not only does it provide the readers with chaos fundamentals and intelligent control-based algorithms; it also discusses key applications of chaos as well as multidisciplinary solutions developed via intelligent control. The book is a timely and comprehensive reference guide for graduate students, researchers, and practitioners in the areas of chaos theory and intelligent control.

The field of observer based fault diagnosis for nonlinear systems has become an important topic of research in the control community over the last three decades. In this thesis, the issues of robust fault detection, isolation and estimation of actuator faults and sensor faults for Lipschitz nonlinear systems has been studied using sliding mode, adaptive and descriptor system approaches. The problem of estimating actuator faults is initially discussed. The sliding mode observer (SMO) is constructed directly based on the uncertain nonlinear system. The fault is reconstructed using the concept of equivalent output injection. Sensor faults are treated as actuator faults by using integral observer based approach and then the problem of sensor fault diagnosis, including detection, isolation and estimation is studied. The proposed scheme has the ability of successfully diagnosing incipient sensor faults in the presence of system uncertainties. The results are then extended to simultaneously estimate actuator faults and sensor faults using SMOs, adaptive observers (AO) and descriptor system approaches.
H\_ filtering is integrated into the observers to ensure that the fault estimation error as well as the state estimation error are less than a prescribed performance level. The existence of the proposed fault estimators and their stability analysis are carried out in terms of LMIs. It has been observed that when the Lipschitz constant is unknown or too large, it may fail to find feasible solutions for observers. In order to deal with this situation, adaptation laws are used to generate an additional control input to the nonlinear system. The additional control input can eliminate the effect of Lipschitz constant on the solvability of LMIs. The effectiveness of various methods proposed in this research has been demonstrated using several numerical and practical examples. The simulation results demonstrate that the proposed methods can achieve the prescribed performance requirements.

A smart civil structure integrates smart materials, sensors, actuators, signal processors, communication networks, power sources, diagonal strategies, control strategies, repair strategies, and life-cycle management strategies. It should function optimally and safely in its environment and maintain structural integrity during strong winds, severe earthquakes, and other extreme events. This book extends from the fundamentals to the state-of-the-art. It covers the elements of smart civil structures, their integration, and their functions. The elements consist of smart materials, sensors, control devices, signal processors, and communication networks. Integration refers to multi-scale modelling and model updating, multi-type sensor placement, control theory, and collective placement of control devices and sensors. And the functions include structural health monitoring, structural vibration control, structural self-repairing, and structural energy harvesting, with emphasis on their synthesis to form truly smart civil structures. It suits civil engineering students, professionals, and researchers with its blend of principles and practice.

Advances in Neural Networks - ISNN 2009
Fault Diagnosis and Prognosis Techniques for Complex Engineering Systems
Robust Observer Based Fault Diagnosis for Nonlinear Systems
Robust Adaptive Control for Fractional-Order Systems with Disturbance and Saturation
Disturbance Observer-Based Control
Observer-Based Fault Estimation and Accomodation for Dynamic Systems
Fault Detection and Fault-Tolerant Control for Nonlinear Systems
Proceedings of the FISITA 2012 World Automotive Congress
Model-Based Fault Diagnosis Techniques
Applications of Nonlinear Control

This volume collects recent advances in nonlinear delay systems, with an emphasis on constructive generalized Lyapunov and predictive approaches that certify stability properties. The book is written by experts in the field and
includes two chapters by Miroslav Krstic, to whom this volume is dedicated. This volume is suitable for all researchers in mathematics and engineering who deal with nonlinear delay control problems and students who would like to understand the current state of the art in the control of nonlinear delay systems.

Linlin Li addresses the analysis and design issues of observer-based FD and FTC for nonlinear systems. The author analyses the existence conditions for the nonlinear observer-based FD systems to gain a deeper insight into the construction of FD systems. Aided by the T-S fuzzy technique, she recommends different design schemes, among them the $L_{\infty}/L_2$ type of FD systems. The derived FD and FTC approaches are verified by two benchmark processes.

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.

This book presents the proceedings of the Third International Conference on Electrical Engineering and Control (ICEECA2017). It covers new control system models and troubleshooting tips, and also addresses complex system requirements, such as increased speed, precision and remote capabilities, bridging the gap between the complex, math-heavy controls theory taught in formal courses, and the efficient implementation required in real-world industry settings. Further, it considers both the engineering aspects of signal processing and the practical issues in the broad field of information transmission and novel technologies for communication networks and modern antenna design.

This book is intended for researchers, engineers, and advanced postgraduate students in control and electrical engineering, computer science, signal processing, as well as mechanical and chemical engineering.

The book reports on the latest advances and applications of nonlinear control systems. It consists of 30 contributed chapters by subject experts who are specialized in the various topics addressed in this book. The special chapters have been brought out in the broad areas of nonlinear control systems such as robotics, nonlinear circuits, power systems, memristors, underwater vehicles, chemical processes, observer design, output regulation, backstepping control, sliding mode control, time-delayed control, variables structure control, robust adaptive control, fuzzy logic control, chaos, hyperchaos, jerk systems, hyperjerk systems, chaos control, chaos synchronization, etc. Special importance was given to chapters offering practical solutions, modeling and novel control methods for the recent
research problems in nonlinear control systems. This book will serve as a reference book for graduate students and researchers with a basic knowledge of electrical and control systems engineering. The resulting design procedures on the nonlinear control systems are emphasized using MATLAB software. This book systematizes recent research work on variable-structure control. It is self-contained, presenting necessary mathematical preliminaries so that the theoretical developments can be easily understood by a broad readership. The text begins with an introduction to the fundamental ideas of variable-structure control pertinent to their application in complex nonlinear systems. In the core of the book, the authors lay out an approach, suitable for a large class of systems, that deals with system uncertainties with nonlinear bounds. Its treatment of complex systems in which limited measurement information is available makes the results developed convenient to implement. Various case-study applications are described, from aerospace, through power systems to river pollution control with supporting simulations to aid the transition from mathematical theory to engineering practicalities. The book addresses systems with nonlinearities, time delays and interconnections and considers issues such as stabilization, observer design, and fault detection and isolation. It makes extensive use of numerical and practical examples to render its ideas more readily absorbed. Variable-Structure Control of Complex Systems will be of interest to academic researchers studying control theory and its application in nonlinear, time-delayed an modular large-scale systems; the robustness of its approach will also be attractive to control engineers working in industries associate with aerospace, electrical and mechanical engineering.

Optimization, Control, Circuit Realizations and Applications
New Trends in Observer-Based Control
Sliding Mode Control Methodology in the Applications of Industrial Power Systems
An Introduction to Design Approaches and Engineering Applications
Observer-Based Fault Diagnosis and Fault-Tolerant Control for Switched Systems
Advances and Applications in Nonlinear Control Systems
Neural Network-Based State Estimation of Nonlinear Systems
Applications of Chaos and Nonlinear Dynamics in Engineering -
Robust Observer-Based Fault Diagnosis for Nonlinear Systems Using MATLAB®
Design Schemes, Algorithms and Tools