

Access Free Fault Tolerant Control Systems Design And Practical Applications

Fault Tolerant Control Systems Design And Practical Applications | e1704adf24ce9f4d3c441b6125ea7419

Robust and Fault-Tolerant Control Fault Detection and Fault-Tolerant Control for Nonlinear Systems Diagnosis and Fault-Tolerant Control Design and Analysis of Reliable and Fault-Tolerant Computer Systems Encyclopedia of Systems and Control Fault-tolerant Control System Design Fault-Tolerant Process Control Control Systems, Robotics and Automation - Volume XVII Advanced methods for fault diagnosis and fault-tolerant control Fault-tolerant Flight Control and Guidance Systems Fault-tolerant Control Systems An Investigation Into Reliable and Fault-tolerant Control Systems Design Data-driven Design of Fault Diagnosis and Fault-tolerant Control Systems Fault Detection, Supervision and Safety of Technical Processes 2003 (SAFEPROCESS 2003) Fault-Tolerant Design and Control of Automated Vehicles and Processes Fault Tolerant Control Design for Hybrid Systems Set-theoretic Fault-tolerant Control in Multisensor Systems Analysis and Synthesis of Fault-Tolerant Control Systems Advances in Gain-Scheduling and Fault Tolerant Control Techniques Fault Tolerant Control Schemes Using Integral Sliding Modes Fault-Tolerant Process Control Active Fault Tolerant Control Systems Diagnosis and Fault-Tolerant Control Fault-Tolerant Attitude Control of Spacecraft Reliability-based Fault Tolerant Control Systems Design and Evaluation of Real-time Fault-tolerant Control Systems Fault Detection and Fault-Tolerant Control Using Sliding Modes Fault Tolerant Control Systems Design Design of Fault Tolerant Control Systems for AHS Diagnosis and Fault-Tolerant Control Design, Analysis and Implementation of Fault-tolerant Control Systems with Application to Electric Machines [microform] Fault Diagnosis and Fault-Tolerant Control Based on Adaptive Control Approach Active Fault-Tolerant Control Systems Observer-Based Fault Diagnosis and Fault-Tolerant Control for Switched Systems Fault Tolerant Control Systems Design Active Fault-Tolerant Control Systems Fault Tolerant Flight Control Adaptive and Fault-Tolerant Control of Underactuated Nonlinear Systems Fault Tolerant Flight Control Design of Neural Fault-tolerant Control Systems

Modern technological systems rely on sophisticated control functions to meet increased performance requirements. For such systems, Fault Tolerant Control Systems (FTCS) need to be developed. Active FTCS are dependent on a Fault Detection and Identification (FDI) process to monitor system performance and to detect and isolate faults in the systems. The main objective of this book is to study and to validate some important issues in real-time Active FTCS by means of theoretical analysis and simulation. Several models are presented to achieve this objective, taking into consideration practical aspects of the system to be controlled, performance deterioration in FDI algorithms, and limitations in reconfigurable control laws.

The key attribute of a Fault Tolerant Control (FTC) system is its ability to maintain overall system stability and acceptable performance in the face of faults and failures within the feedback system. In this book Integral Sliding Mode (ISM) Control Allocation (CA) schemes for FTC are described, which have the potential to maintain close to nominal fault-free performance (for the entire system response), in the face of actuator faults and even complete failures of certain actuators. Broadly an ISM controller based around a model of the plant with the aim of creating a nonlinear fault tolerant feedback controller whose closed-loop performance is established during the design process. The second approach involves retro-fitting an ISM scheme to an existing feedback controller to introduce fault tolerance. This may be advantageous from an industrial perspective, because fault tolerance can be introduced without changing the existing control loops. A high fidelity benchmark model of a large transport aircraft is used to demonstrate the efficacy of the FTC schemes. In particular a scheme based on an LPV representation has been implemented and tested on a motion flight simulator.

The book presents effective model-based analysis and design methods for fault diagnosis and fault-tolerant control. Architectural and structural models are used to analyse the propagation of the fault through the process, to test the fault detectability and to find the redundancies in the process that can be used to ensure fault tolerance. Design methods for diagnostic systems and fault-tolerant controllers are presented for processes that are described by analytical models, by discrete-event models or that can be dealt with as quantised systems. Four case studies on pilot processes show the applicability of the presented methods. The theoretical results are illustrated by two running examples which are used throughout the book. The book addresses engineering students, engineers in industry and researchers who wish to get a survey over the variety of approaches to process diagnosis and fault-tolerant control.

A three-volume work bringing together papers presented at 'SAFEPROCESS 2003', including four plenary papers on statistical, physical-model-based and logical-model-based approaches to fault detection and diagnosis, as well as 178 regular papers.

This book summarizes strategies, methods, algorithms, frameworks and systems for the fault-tolerant design and control of automated vehicles and processes. Intelligent systems may be able to accommodate inevitable faults, but this ability requires targeted design processes and advanced control systems. This book explains the respective elements involved in automated vehicles and processes. It provides detailed descriptions of fault-tolerant design, not offered in the existent scientific literature. With regard to fault-tolerant control, the focus is on innovative methods, which can accommodate not only uncertainties, but also shared and flexible redundant elements. The book is intended to present a concise guide for researchers in the field of fault-tolerant design and control, and to provide concrete insights for design and control engineers working in the field of automated vehicles and processes.

The book introduces novel algorithms for designing fault-tolerant control (FTC) systems using the behavioral system theoretic approach, and presents a demonstration of successful novel FTC mechanisms on several benchmark examples. The authors also discuss a new transient management scheme, which is an essential requirement for the implementation of active FTC systems, and two data-driven methodologies that are broadly classified as active FTC systems: the projection-based approach and the online-redesign approach. These algorithms do not require much a priori information about the plant in real-time, and in addition this novel implementation of active FTC systems circumvents various weaknesses induced by using a diagnostic module in real-time. The book provides graduate students taking masters and doctoral courses in mathematics, control, and electrical engineering an excellent stepping-stone for their research. It also appeals to practitioners interested to apply innovative fail-safe control techniques.

Fault-tolerant control theory is a well-studied topic but the use of the sets in detection, isolation and/or reconfiguration is rather tangential. The authors of this book propose a systematic analysis of the set-theoretic elements and devise approaches which exploit advanced elements within the field. The main idea is to translate fault detection and isolation conditions into those conditions involving sets. Furthermore, these are to be computed efficiently using positive invariance and reachability notions. Constraints imposed by exact fault control are used to define feasible references (which impose persistent excitation and, thus, non-convex feasible sets). Particular attention is given to the reciprocal influences between fault detection and isolation on the one hand, and control reconfiguration on the other. Contents 1. State of the Art in Fault-tolerant Control 2. Fault Detection and Isolation in Multisensor Systems 3. Residual Generation and Reference Governor Design 4. Reconfiguration of the Control Mechanism for Fault-tolerant Control 5. Related Problems and Applications About the Authors Florin Stoican received a B.E. degree from the "Politehnica" University of Bucharest, Romania, in 2008 and his PhD from SUPELEC, France in 2011. He held an ERCIM Postdoctoral Fellowship with NTNU Trondheim, Norway, in 2012, and is currently Assistant Professor at "Politehnica" University of Bucharest. His main interest is the fault tolerant control of dynamical systems through the prism of set theoretic elements. His current work involves further results in set theory and constrained optimization problems. Sorin Olaru received an M.S. degree from the "Politehnica" University of Bucharest, Romania, and both his PhD and Habilitation from University Paris XI, France, being awarded the European Commission Archimedes Prize in 2002. Since 2001 he has held different positions at INRIA and SUPELEC in France and visiting appointments at the University of Newcastle, Australia and NTNU Trondheim, Norway. He is currently Professor at SUPELEC, a member of the INRIA Disco team and senior member of IEEE. His research interests include optimization-based control design and the set-theoretic characterization of constrained dynamical systems.

In recent years, control systems have become more sophisticated in order to meet increased performance and safety requirements for modern technological systems. Engineers are becoming more aware that conventional feedback control design for a complex system may result in unsatisfactory performance, or even instability, in the event of malfunctions in actuators, sensors or other system components. In order to circumvent such weaknesses, new approaches to control system design have emerged which can tolerate component malfunctions while maintaining acceptable stability and performance. These types of control systems are often known as fault-tolerant control systems (FTCS). More precisely, FTCS are control systems which possess the ability to accommodate component failure automatically. Analysis and Synthesis of Fault-Tolerant Control Systems comprehensively covers the analysis and synthesis methods of fault-tolerant control systems. It unifies the methods for developing controllers and filters for a wide class of dynamical systems and reports on the recent technical advances in design methodologies. MATLAB® is used throughout the book, to demonstrate methods of analysis and design. Key features: • Provides advanced theoretical methods and typical practical applications • Provides access to a spectrum of control design methods applied to industrial systems • Includes case studies and illustrative examples • Contains end-of-chapter problems Analysis and Synthesis of Fault-Tolerant Control Systems is a comprehensive reference for researchers and practitioners working in this area, and is also a valuable source of information for graduates and senior undergraduates in control, mechanical, aerospace, electrical and mechatronics engineering departments.

Written by leading experts in the field, this book provides the state-of-the-art in terms of fault tolerant control applicable to civil aircraft. The book consists of five parts and includes online material.

Fault-Tolerant Process Control focuses on the development of general, yet practical, methods for the design of advanced fault-tolerant control systems; these ensure an efficient fault detection and a timely response to enhance fault recovery, prevent faults from propagating or developing into total failures, and reduce the risk of safety hazards. To this end, methods are presented for the design of advanced fault-tolerant control systems for chemical processes which explicitly deal with actuator/controller failures and sensor faults and data losses. Specifically, the book puts forward: • A framework for detection, isolation and diagnosis of actuator and sensor faults for nonlinear systems; • Controller reconfiguration and safe-parking-based fault-handling methodologies; • Integrated data- and model-based fault-detection and isolation and fault-tolerant control methods; • Methods for handling sensor faults and data losses; and • Methods for monitoring the performance of low-level PID loops. The methodologies proposed employ nonlinear systems analysis, Lyapunov techniques, optimization, statistical methods and hybrid systems theory and are predicated upon the idea of integrating fault-detection, local feedback control, and supervisory control. The applicability and performance of the methods are demonstrated through a number of chemical process examples. Fault-Tolerant Process Control is a valuable resource for academic researchers, industrial practitioners as well as graduate students pursuing research in this area.

This thesis deals with the development of Fault-Tolerant Control Systems (FTCS). Fault-tolerant control systems are closed-loop control systems that can tolerate system component faults and maintain system stability and a certain degree of performance. They are used to enhance system reliability and are extremely important in safety-critical applications. In this thesis, the model of a system with possible component faults is first formulated mathematically. Definitions of hardware redundancy, analytical redundancy and hybrid redundancy are provided. The FTCS is classified into passive FTCS and active FTCS based on how the system utilizes the Fault Detection and Isolation (FDI) information. Existing design methods for both passive and active FTCS are reviewed, and new design methods for passive FTCS against sensor faults and active FTCS against actuator faults are proposed and verified on a lab-scale electric machine system. The test results demonstrate the effectiveness of the design. One of the important components in active FTCS is the FDI schemes that rely on so called residual signals. It is shown in this thesis that many of the existing FDI residual generation methods only work for open-loop systems or closed-loop systems without integral terms in its controller. A new method to generate the residual signal for closed-loop systems is proposed based on the results from the sensitivity analysis once the characteristics of a closed-loop

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control system are known. The original contributions of this thesis are: (i) to determine the limitations of the existing FDI schemes for closed-loop systems and to propose a new way to generate the FDI residual signal; (ii) to apply the FDI and FTCS theories to the design of a passive FTCS for a DC motor speed control system and an active FTCS for a synchronous generator excitation control system. The proposed design methods can readily be extended to other applications.

Fault-tolerant control aims at a gradual shutdown response in automated systems when faults occur. It satisfies the industrial demand for enhanced availability and safety, in contrast to traditional reactions to faults, which bring about sudden shutdowns and loss of availability. The book presents effective model-based analysis and design methods for fault diagnosis and fault-tolerant control. Architectural and structural models are used to analyse the propagation of the fault through the process, to test the fault detectability and to find the redundancies in the process that can be used to ensure fault tolerance. It also introduces design methods suitable for diagnostic systems and fault-tolerant controllers for continuous processes that are described by analytical models of discrete-event systems represented by automata. The book is suitable for engineering students, engineers in industry and researchers who wish to get an overview of the variety of approaches to process diagnosis and fault-tolerant control. The authors have extensive teaching experience with graduate and PhD students, as well as with industrial experts. Parts of this book have been used in courses for this audience. The authors give a comprehensive introduction to the main ideas of diagnosis and fault-tolerant control and present some of their most recent research achievements obtained together with their research groups in a close cooperation with European research projects. The third edition resulted from a major re-structuring and re-writing of the former edition, which has been used for a decade by numerous research groups. New material includes distributed diagnosis of continuous and discrete-event systems, methods for reconfigurability analysis, and extensions of the structural methods towards fault-tolerant control. The bibliographical notes at the end of all chapters have been up-dated. The chapters end with exercises to be used in lectures.

The book introduces novel algorithms for designing fault-tolerant control (FTC) systems using the behavioral system theoretic approach, and presents a demonstration of successful novel FTC mechanisms on several benchmark examples. The authors also discuss a new transient management scheme, which is an essential requirement for the implementation of active FTC systems, and two data-driven methodologies that are broadly classified as active FTC systems: the projection-based approach and the online-redesign approach. These algorithms do not require much a priori information about the plant in real-time, and in addition this novel implementation of active FTC systems circumvents various weaknesses induced by using a diagnostic module in real-time. The book provides graduate students taking masters and doctoral courses in mathematics, control, and electrical engineering an excellent stepping-stone for their research. It also appeals to practitioners interested to apply innovative fail-safe control techniques.

The purpose of the book is to provide an exposition of recently developed adaptive and fault-tolerant control of underactuated nonlinear systems. Underactuated systems are abundant in real life, ranging from landing vehicles to surface ships and underwater vehicles to spacecrafts. For the tracking and stabilization control of underactuated mechanical systems, many methodologies have been proposed. However, a number of important issues deserve further investigation. In response to these issues, four important problems are solved in this book, including control of underactuated nonlinear systems with input saturation, output-feedback control in the presence of parametric uncertainties, fault-tolerant control of underactuated ships with or without actuator redundancy, and adaptive control of multiple underactuated nonlinear systems, including formation control and flocking control of multiple underactuated 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.

Written by leading experts in the field, this book provides the state-of-the-art in terms of fault tolerant control applicable to civil aircraft. The book consists of five parts and includes online material.

This book offers a complete overview of fault-tolerant flight control techniques. Discussion covers the necessary equations for the modeling of small UAVs, a complete system based on extended Kalman filters, and a nonlinear flight control and guidance system.

This thesis reports on novel methods for gain-scheduling and fault tolerant control (FTC). It begins by analyzing the connection between the linear parameter varying (LPV) and Takagi-Sugeno (TS) paradigms. This is then followed by a detailed description of the design of robust and shifting state-feedback controllers for these systems. Furthermore, it presents two approaches to fault-tolerant control: the first is based on a robust polytopic controller design, while the second involves a reconfiguration of the reference model and the addition of virtual actuators into the loop. In addition the thesis offers a thorough review of the state-of-the-art in gain scheduling and fault-tolerant control, with a special emphasis on LPV and TS systems.

The series *Advances in Industrial Control* aims to report and encourage technology transfer in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. New theory, new controllers, actuators, sensors, new industrial processes, computer methods, new applications, new philosophies, . . . , new challenges. Much of this development work resides in industrial reports, feasibility study papers, and the reports of advanced collaborative projects. The series offers an opportunity for researchers to present an extended exposition of such new work in all aspects of industrial control for wider and rapid dissemination. Control system design and technology continues to develop in many different directions. One theme that the *Advances in Industrial Control* series is following is the application of nonlinear control design methods, and the series has some interesting new commissions in progress. However, another theme of interest is how to endow the industrial controller with the ability to overcome faults and process degradation. Fault detection and isolation is a broad field with a research literature spanning several decades. This topic deals with three questions: • How is the presence of a fault detected? • What is the cause of the fault? • Where is it located? However, there has been less focus on the question of how to use the control system to accommodate and overcome the performance deterioration caused by the identified sensor or actuator fault.

Data-driven Design of Fault Diagnosis and Fault-tolerant Control Systems presents basic statistical process monitoring, fault diagnosis, and control methods and introduces advanced data-driven schemes for the design of fault diagnosis and fault-tolerant control systems catering to the needs of dynamic industrial processes. With ever increasing demands for reliability, availability and safety in technical processes and assets, process monitoring and fault-tolerance have become important issues surrounding the design of automatic control systems. This text shows the reader how, thanks to the rapid development of information technology, key techniques of data-driven and statistical process monitoring and control can now become widely used in industrial practice to address these issues. To allow for self-contained study and facilitate implementation in real applications, important mathematical and control theoretical knowledge and tools are included in this book. Major schemes are presented in algorithm form and demonstrated on industrial case systems. Data-driven Design of Fault Diagnosis and Fault-tolerant Control Systems will be of interest to process and control engineers, engineering students and researchers with a control engineering background.

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.

This Encyclopedia of Control Systems, Robotics, and Automation is a component of the global Encyclopedia of Life Support Systems EOLSS, which is an integrated compendium of twenty one Encyclopedias. This 22-volume set contains 240 chapters, each of size 5000-30000 words, with perspectives, applications and extensive illustrations. It is the only publication of its kind carrying state-of-the-art knowledge in the fields of Control Systems, Robotics, and Automation and is aimed, by virtue of the several applications, at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers and NGOs.

Fault-Tolerant Attitude Control of Spacecraft presents the fundamentals of spacecraft fault-tolerant attitude control systems, along with the most recent research and advanced, nonlinear control techniques. This book gives researchers a self-contained guide to the complex tasks of envisaging, designing, implementing and experimenting by presenting designs for integrated modeling, dynamics, fault-tolerant attitude control, and fault reconstruction for spacecraft. Specifically, the book gives a full literature review and presents preliminaries and mathematical models, robust fault-tolerant attitude control, fault-tolerant attitude control with actuator saturation, velocity-free fault tolerant attitude control, finite-time fault-tolerant attitude tracking control, and active fault-tolerant attitude control. Finally, the book looks at the future of this interesting topic, offering readers a one-stop solution for those working on fault-tolerant attitude control for spacecraft. Presents the fundamentals of fault-tolerant attitude control systems for spacecraft in one practical solution Gives the latest research and thinking on nonlinear attitude control, fault tolerant control, and reliable attitude control Brings together concepts in fault control theory, fault diagnosis, and attitude control for spacecraft Covers advances in theory, technological aspects, and applications in spacecraft Presents detailed numerical and simulation results to assist engineers Offers a clear, systematic reference on fault-tolerant control and attitude control for spacecraft

The Encyclopedia of Systems and Control collects a broad range of short expository articles that describe the current state of the art in the central topics of control and systems engineering as well as in many of the related fields in which control is an enabling technology. The editors have assembled the most comprehensive reference possible, and this has been greatly facilitated by the publisher's commitment continuously to publish updates to the articles as they become available in the future. Although control engineering is now a mature discipline, it remains an area in which there is a great deal of research activity, and as new developments in both theory and applications become available, they will be included in the online version of the encyclopedia. A carefully chosen team of leading authorities in the field has written the well over 250 articles that comprise the work. The topics range from basic principles of feedback in servomechanisms to advanced topics such as

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the control of Boolean networks and evolutionary game theory. Because the content has been selected to reflect both foundational importance as well as subjects that are of current interest to the research and practitioner communities, a broad readership that includes students, application engineers, and research scientists will find material that is of interest.

Fault-Tolerant Process Control focuses on the development of general, yet practical, methods for the design of advanced fault-tolerant control systems; these ensure an efficient fault detection and a timely response to enhance fault recovery, prevent faults from propagating or developing into total failures, and reduce the risk of safety hazards. To this end, methods are presented for the design of advanced fault-tolerant control systems for chemical processes which explicitly deal with actuator/controller failures and sensor faults and data losses. Specifically, the book puts forward: · A framework for detection, isolation and diagnosis of actuator and sensor faults for nonlinear systems; · Controller reconfiguration and safe-parking-based fault-handling methodologies; · Integrated-data- and model-based fault-detection and isolation and fault-tolerant control methods; · Methods for handling sensor faults and data losses; and · Methods for monitoring the performance of low-level PID loops. The methodologies proposed employ nonlinear systems analysis, Lyapunov techniques, optimization, statistical methods and hybrid systems theory and are predicated upon the idea of integrating fault-detection, local feedback control, and supervisory control. The applicability and performance of the methods are demonstrated through a number of chemical process examples. Fault-Tolerant Process Control is a valuable resource for academic researchers, industrial practitioners as well as graduate students pursuing research in this area.

This book provides recent theoretical developments in and practical applications of fault diagnosis and fault tolerant control for complex dynamical systems, including uncertain systems, linear and nonlinear systems. Combining adaptive control technique with other control methodologies, it investigates the problems of fault diagnosis and fault tolerant control for uncertain dynamic systems with or without time delay. As such, the book provides readers a solid understanding of fault diagnosis and fault tolerant control based on adaptive control technology. Given its depth and breadth, it is well suited for undergraduate and graduate courses on linear system theory, nonlinear system theory, fault diagnosis and fault tolerant control techniques. Further, it can be used as a reference source for academic research on fault diagnosis and fault tolerant control, and for postgraduates in the field of control theory and engineering.

Robust and Fault-Tolerant Control proposes novel automatic control strategies for nonlinear systems developed by means of artificial neural networks and pays special attention to robust and fault-tolerant approaches. The book discusses robustness and fault tolerance in the context of model predictive control, fault accommodation and reconfiguration, and iterative learning control strategies. Expanding on its theoretical deliberations the monograph includes many case studies demonstrating how the proposed approaches work in practice. The most important features of the book include: a comprehensive review of neural network architectures with possible applications in system modelling and control; a concise introduction to robust and fault-tolerant control; step-by-step presentation of the control approaches proposed; an abundance of case studies illustrating the important steps in designing robust and fault-tolerant control; and a large number of figures and tables facilitating the performance analysis of the control approaches described. The material presented in this book will be useful for researchers and engineers who wish to avoid spending excessive time in searching neural-network-based control solutions. It is written for electrical, computer science and automatic control engineers interested in control theory and their applications. This monograph will also interest postgraduate students engaged in self-study of nonlinear robust and fault-tolerant control.

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_{∞}/L_2 type of FD systems. The derived FD and FTC approaches are verified by two benchmark processes.

This book presents model-based analysis and design methods for fault diagnosis and fault-tolerant control. Architectural and structural models are used to analyse the propagation of the fault through the process, test fault detectability and reveal redundancies that can be used to ensure fault tolerance. Case studies demonstrate the methods presented. The second edition includes new material on reconfigurable control, diagnosis of nonlinear systems, and remote diagnosis, plus new examples and updated bibliography.

Covering both the theoretical and practical aspects of fault-tolerant mobile systems, and fault tolerance and analysis, this book tackles the current issues of reliability-based optimization of computer networks, fault-tolerant mobile systems, and fault tolerance and reliability of high speed and hierarchical networks. The book is divided into six parts to facilitate coverage of the material by course instructors and computer systems professionals. The sequence of chapters in each part ensures the gradual coverage of issues from the basics to the most recent developments. A useful set of references, including electronic sources, is listed at the end of each chapter. Contents: Fundamental Concepts in Fault Tolerance and Reliability Analysis; Fault Modeling, Simulation and Diagnosis; Error Control and Self-Checking Circuits; Fault Tolerance in Multiprocessor Systems; Fault-Tolerant Routing in Multi-Computer Networks; Fault Tolerance and Reliability in Hierarchical Interconnection Networks; Fault Tolerance and Reliability of Computer Networks; Fault Tolerance in High Speed Switching Networks; Fault Tolerance in Distributed and Mobile Computing Systems; Fault Tolerance in Mobile Networks; Reliability and Yield Enhancement of VLSI/WSI Circuits; Design of fault-tolerant Processor Arrays; Algorithm-Based Fault Tolerance; System Level Diagnosis I; System Level Diagnosis II; Fault Tolerance and Reliability of RAID Systems; High Availability in Computer Systems. Readership: Computer engineers, computer scientists, information scientists, graduate and senior undergraduate students in information science and computer engineering. Keywords: Fault Tolerance; Reliability; Availability; Fault Modeling; Fault Diagnosis; Network Reliability. Key Features: Comprehensive coverage of issues in fault tolerance and reliability analysis; Simple treatment of difficult issues via examples with figures, tables and graphs.

This book provides readers a good understanding on how to achieve Fault Tolerant Control goal of Hybrid Systems. It presents important theoretical results as well as their applications.

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