R. Isermann

Fault-Diagnosis Systems

An Introduction from Fault Detection to Fault Tolerance

Springer

Fault Diagnosis Systems An Introduction From Fault Detection To Fault Tolerance

Rolf Isermann

Fault Diagnosis Systems An Introduction From Fault Detection To Fault Tolerance:

Fault-Diagnosis Systems Rolf Isermann,2006-01-16 With increasing demands for efficiency and product quality plus progress in the integration of automatic control systems in high cost mechatronic and safety critical processes the field of supervision or monitoring fault detection and fault diagnosis plays an important role The book gives an introduction into advanced methods of fault detection and diagnosis FDD After definitions of important terms it considers the reliability availability safety and systems integrity of technical processes Then fault detection methods for single signals without models such as limit and trend checking and with harmonic and stochastic models such as Fourier analysis correlation and wavelets are treated This is followed by fault detection with process models using the relationships between signals such as parameter estimation parity equations observers and principal component analysis The treated fault diagnosis methods include classification methods from Bayes classification to neural networks with decision trees and inference methods from approximate reasoning with fuzzy logic to hybrid fuzzy neuro systems Several practical examples for fault detection and diagnosis of DC motor drives a centrifugal pump automotive suspension and tire demonstrate applications

Fault-Diagnosis Systems Rolf Isermann,2005-10-13 With increasing demands for efficiency and product quality plus progress in the integration of automatic control systems in high cost mechatronic and safety critical processes the field of supervision or monitoring fault detection and fault diagnosis plays an important role The book gives an introduction into advanced methods of fault detection and diagnosis FDD After definitions of important terms it considers the reliability availability safety and systems integrity of technical processes Then fault detection methods for single signals without models such as limit and trend checking and with harmonic and stochastic models such as Fourier analysis correlation and wavelets are treated This is followed by fault detection with process models using the relationships between signals such as parameter estimation parity equations observers and principal component analysis The treated fault diagnosis methods include classification methods from Bayes classification to neural networks with decision trees and inference methods from approximate reasoning with fuzzy logic to hybrid fuzzy neuro systems Several practical examples for fault detection and diagnosis of DC motor drives a centrifugal pump automotive suspension and tire demonstrate applications   Fault-tolerant Flight Control and Guidance Systems Guillaume J. J. Ducard,2009-05-14 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   **Fault-Diagnosis Applications** Rolf Isermann,2011-04-06 Supervision condition monitoring fault detection fault diagnosis and fault management play an increasing role for technical processes and vehicles in order to improve reliability availability maintenance and lifetime For safety related processes fault tolerant systems with redundancy are required in order to reach comprehensive system integrity This book is a sequel of the book Fault Diagnosis Systems published in 2006 where the basic

methods were described After a short introduction into fault detection and fault diagnosis methods the book shows how these methods can be applied for a selection of 20 real technical components and processes as examples such as Electrical drives DC AC Electrical actuators Fluidic actuators hydraulic pneumatic Centrifugal and reciprocating pumps Pipelines leak detection Industrial robots Machine tools main and feed drive drilling milling grinding Heat exchangers Also realized fault tolerant systems for electrical drives actuators and sensors are presented The book describes why and how the various signal model based and process model based methods were applied and which experimental results could be achieved In several cases a combination of different methods was most successful The book is dedicated to graduate students of electrical mechanical chemical engineering and computer science and for engineers **Analysis and Synthesis of Fault-Tolerant Control Systems** Magdi S. Mahmoud,Yuanqing Xia,2013-10-28 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 Bremsenhandbuch Bert Breuer,Karlheinz H. Bill,2017-10-01 Dieses Buch behandelt umfassend Grundlagen Anforderungen Auslegungen Aufbau Gestaltungen Komponenten und Teilsystemfunktionen im modernen Kraftfahrzeug auch von gel ndeg ngigen Rad und Kettenfahrzeugen sowie von Zweirad und Luftfahrzeugen Als einziges Fachbuch in deutscher Sprache stellt es diesen sensiblen sicherheitsrelevanten Bereich der Fahrzeugtechnik fachwissenschaftlich fundiert und gleichzeitig praxisorientiert dar Kfz Ingenieure und Techniker kommen ohne detailliertes Wissen ber moderne Fahrzeugbremsen bis hin zur Mechatronik nicht mehr aus Diese Auflage wurde gr ndlich berarbeitet aktualisiert und erweitert Damit wird das Bremsen von Elektro und Hybridfahrzeugen besonders ber cksichtigt

Konsistenzbasierte Fehlerdiagnose nichtlinearer Systeme mittels Zustandsmengenbeobachtung Florian Wolff,2014-08-18 Diese Arbeit beschreibt ein Verfahren zur konsistenzbasierten Fehlerdiagnose zeitkontinuierlicher nichtlinearer Systeme mittels Zustandsmengenbeobachtung Der Schwerpunkt liegt dabei auf der Durchf hrung der Zustandsmengenbeobachtung mittels Einschlie ungsverfahren f r gew hnliche Differenzialgleichungssysteme Es werden zwei Konzepte zur Zustandsmengenbeobachtung vorgestellt und verglichen sowie anhand von Anwendungsbeispielen deren praktische Einsetzbarkeit verdeutlicht *Advanced Solutions in Diagnostics and Fault Tolerant Control* Jan M. Kościelny,Michał Syfert,Anna Sztyber,2017-07-28 This book highlights the latest achievements concerning the theory methods and practice of fault diagnostics fault tolerant systems and cyber safety When considering the diagnostics of industrial processes and systems increasingly important safety issues cannot be ignored In this context diagnostics plays a crucial role as a primary measure of the improvement of the overall system safety integrity level Obtaining the desired diagnostic coverage or providing an appropriate level of inviolability of the integrity of a system is now practically inconceivable without the use of fault detection and isolation methods Given the breadth and depth of its coverage the book will be of interest to researchers faced with the challenge of designing technical and medical diagnosis systems as well as junior researchers and students in the fields of automatic control robotics computer science and artificial intelligence

Grundlagen Verbrennungsmotoren Günter P. Merker,Rüdiger Teichmann,2019-03-04 F r die vorliegende 9 Auflage wurde der Inhalt vollst ndig neu strukturiert und in k rzere und in sich abgeschlossene Kapitel aufgeteilt Einleitend beschreibt das Werk die Funktionsweise von Verbrennungsmotoren f r Fahrzeuge und station re Anwendungen sowie diejenige f r alternative Antriebssysteme Daran anschlie end spannen die Autoren einen Bogen von einfachen thermodynamischen Grundlagen des Verbrennungsmotors hin zu komplexen Modellans tzen zur Beschreibung der Gemischbildung Z ndung Verbrennung und Schadstoffbildung unter Beachtung der Motorperipherie von Otto und Dieselmotoren Damit liegt der inhaltliche Schwerpunkt dieses Bandes auf den Simulationsmodellen und deren str mungstechnischen thermodynamischen und verbrennungschemischen Grundlagen sowie der Messtechnik zur Verifikation dieser Modelle wie sie f r die Entwicklung moderner Verbrennungsmotoren unentbehrlich sind F r die aktuelle Auflage wurde vor allem das Thema alternative Antriebssysteme durch die Behandlung von Brennstoffzellen und elektrischen Antriebssystemen stark erweitert Alle Kapitel wurden vollst ndig berarbeitet und aktualisiert *Fahrdynamik-Regelung* Rolf Isermann,2007-08-19 Die Mechatronik im Fahrzeug hat heute entscheidenden Einfluss auf die Gestaltung der Radaufh ngungen Bremsen und Lenkungen und die dadurch m glichen aktiven Eingriffe Regelungen erm glichen so eine Beeinflussung der Fahrdynamik Der Entwurf und die Erprobung dieser mechatronischen Systeme erfordert ein modellgest tztes Vorgehen mit verschiedenen Arten der Simulation modellbasierten Regelungen berwachungs und Diagnosemethoden bis hin zum Test einer automatisierten Fahrzeugf hrung Hier gibt das Buch einen detaillierten berblick Dabei werden besonders mechatronische Bremssysteme aktive Radaufh

ngungen aktive Stabilisatoren aktive Lenksysteme ABS ESP und AFS Regelungen und Fahrer Assistenz Systeme zur Abstandsregelung mit Stop and Go zur Spurf hrung und ein Parkassistent betrachtet Weitere Kapitel behandeln Diagnosesysteme f r die Querdynamik Regelung und aktive Fahrwerke   Fault Diagnosis and Fault Tolerance for Mechatronic Systems: Recent Advances Fabrizio Caccavale,Luigi Villani,2003-09-05 The field of robotics continues to flourish and develop In common with general scientific investigation new ideas and implementations emerge quite spontaneously and these are discussed used discarded or subsumed at c ferences in the reference journals as well as through the Internet After a little more maturity has been acquired by the new concepts then archival publication as a scientific or engineering monograph may occur The goal of the Springer Tracts in Advanced Robotics is to publish new developments and advances in the fields of robotics research rapidly and informally but with a high quality It is hoped that prospective authors will welcome the opportunity to publish a structured presentation of some of the emerging robotics methodologies and technologies The edited volume by Fabrizio Caccavale and Luigi Villani concerns with a wide subject of modern engineering namely mechatronics This new discipline has lately been receiving an increasing deal of attention for its unique connotation to represent a blend of mechanical electronic and information technologies In such a scenario the importance of providing the supervisory control system with fault detection and fault identification capabilities becomes crucial to the effective development of mechatronic systems   **Mechatronische Systeme** Rolf Isermann,2007-11-21 Mechatronische Systeme entstehen durch Integration von vorwiegend mechanischen und elektronischen Systemen sowie zugeh riger Informationsverarbeitung Wesentlich ist dabei die Integration der mechanischen und elektronischen Elemente durch ihre r umliche Anordnung und durch ihre Funktionen sowie die Erzielung synergetischer Effekte Die rtliche Integration erfolgt durch den konstruktiven Entwurf die funktionelle Integration durch die Informationsverarbeitung und damit durch die Gestaltung der Software Das vorliegende Buch f hrt in den Aufbau und die Modellbildung mechatronischer Systeme in einer einheitlichen Form ein und stellt das Verhalten von mechanischen Bauelementen elektrischen Antrieben Maschinen Sensoren Aktoren und Mikrorechnern dar Ziel dabei ist ein bestimmtes Systemverhalten zu erreichen Die zweite Auflage enth lt wesentliche Erweiterungen bei der Entwicklungsmethodik bei mechanischen Komponenten elektrischen Antrieben Beispielen von Maschinenmodellen Sensoren hydraulischen und pneumatischen Aktoren und fehlertoleranten Systemen Aufgabensammlungen erg nzen die einzelnen Kapitel   Diagnosis and Fault-Tolerant Control Mogens Blanke,Michel Kinnaert,Jan Lunze,Marcel Staroswiecki,2015-08-11 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 **Combustion Engine Diagnosis** Rolf Isermann,2017-05-04 This book offers first a short introduction to advanced supervision fault detection and diagnosis methods It then describes model based methods of fault detection and diagnosis for the main components of gasoline and diesel engines such as the intake system fuel supply fuel injection combustion process turbocharger exhaust system and exhaust gas aftertreatment Additionally model based fault diagnosis of electrical motors electric pneumatic and hydraulic actuators and fault tolerant systems is treated In general series production sensors are used It includes abundant experimental results showing the detection and diagnosis quality of implemented faults Written for automotive engineers in practice it is also of interest to graduate students of mechanical and electrical engineering and computer science **Advanced and Intelligent Computations in Diagnosis and Control** Zdzisław Kowalczuk,2015-09-01 This book is devoted to the demands of research and industrial centers for diagnostics monitoring and decision making systems that result from the increasing complexity of automation and systems the need to ensure the highest level of reliability and safety and continuing research and the development of innovative approaches to fault diagnosis The contributions combine domains of engineering knowledge for diagnosis including detection isolation localization identification reconfiguration and fault tolerant control The book is divided into six parts I Fault Detection and Isolation II Estimation and Identification III Robust and Fault Tolerant Control IV Industrial and Medical Diagnostics V Artificial Intelligence VI Expert and Computer Systems *International Joint Conference SOCO'13-CISIS'13-ICEUTE'13* Álvaro Herrero,Bruno Baruque,Fanny Klett,Ajith Abraham,Václav Snášel,André C.P.L.F. de Carvalho,Pablo García Bringas,Ivan Zelinka,Héctor Quintián,Emilio Corchado,2013-08-13 This volume of Advances in Intelligent and Soft Computing contains accepted papers presented at SOCO 2013 CISIS 2013 and ICEUTE 2013 all conferences held in the beautiful and historic city of Salamanca Spain in September 2013 Soft computing represents a collection or set of

computational techniques in machine learning computer science and some engineering disciplines which investigate simulate and analyze very complex issues and phenomena After a through peer review process the 8th SOCO 2013 International Program Committee selected 40 papers which are published in these conference proceedings and represents an acceptance rate of 41% In this relevant edition a special emphasis was put on the organization of special sessions Four special sessions were organized related to relevant topics as Systems Man and Cybernetics Data Mining for Industrial and Environmental Applications Soft Computing Methods in Bioinformatics and Soft Computing Methods Modelling and Simulation in Electrical Engineer The aim of the 6th CISIS 2013 conference is to offer a meeting opportunity for academic and industry related researchers belonging to the various vast communities of Computational Intelligence Information Security and Data Mining The need for intelligent flexible behaviour by large complex systems especially in mission critical domains is intended to be the catalyst and the aggregation stimulus for the overall event After a through peer review process the CISIS 2013 International Program Committee selected 23 papers which are published in these conference proceedings achieving an acceptance rate of 39% In the case of 4th ICEUTE 2013 the International Program Committee selected 11 papers which are published in these conference proceedings The selection of papers was extremely rigorous in order to maintain the high quality of the conference and we would like to thank the members of the Program Committees for their hard work in the reviewing process This is a crucial process to the creation of a high standard conference and the SOCO CISIS and ICEUTE conferences would not exist without their help   **Internationaler Motorenkongress 2016** Johannes Liebl,Christian Beidl,2016-04-08 Wer die gesamte Well to Wheel Kette betrachtet stellt schnell fest Der Verbrennungsmotor und seine Kraftstoffe sind auch heute nicht wegzudenken wenn es gilt Pkw und Nutzfahrzeuge anzutreiben Die Erkenntnis dass die Elektrifizierung der Fahrzeugantriebe sich nur evolution r entwickeln kann sichert dem Verbrennungsmotor weiterhin die Pole Position als Schrittmacher in eine Mobilit t mit geringen Schadstoffemissionen So gilt es vom Dreizylinder Pkw bis zum Achtzylinder Nfz Motor neben verschiedenen technologischen Optimierungsm glichkeiten weitere verborgene Potenzial in den Bereichen Mechanik Ladungswechsel Verbrennung Abgasnachbehandlung und W rmemanagement zu heben Vor dem Hintergrund dieser Entwicklungsaufgaben veranstalten ATZlive und das VDI Wissensforum zum dritten Mal gemeinsam den Internationalen Motorenkongress   **Intelligence for Embedded Systems** Cesare Alippi,2014-07-08 Addressing current issues of which any engineer or computer scientist should be aware this monograph is a response to the need to adopt a new computational paradigm as the methodological basis for designing pervasive embedded systems with sensor capabilities The requirements of this paradigm are to control complexity to limit cost and energy consumption and to provide adaptation and cognition abilities allowing the embedded system to interact proactively with the real world The quest for such intelligence requires the formalization of a new generation of intelligent systems able to exploit advances in digital architectures and in sensing technologies The book sheds light on the theory behind intelligence for embedded systems with specific focus on

robustness the robustness of a computational flow and its evaluation intelligence how to mimic the adaptation and cognition abilities of the human brain the capacity to learn in non stationary and evolving environments by detecting changes and reacting accordingly and a new paradigm that by accepting results that are correct in probability allows the complexity of the embedded application the be kept under control Theories concepts and methods are provided to motivate researchers in this exciting and timely interdisciplinary area Applications such as porting a neural network from a high precision platform to a digital embedded system and evaluatin g its robustness level are described Examples show how the methodology introduced can be adopted in the case of cyber physical systems to manage the interaction between embedded devices and physical world Researchers and graduate students in computer science and various engineering related disciplines will find the methods and approaches propounded in Intelligence for Embedded Systems of great interest The book will also be an important resource for practitioners working on embedded systems and applications *Learning in Non-Stationary Environments* Moamar Sayed-Mouchaweh,Edwin Lughofer,2012-04-13 Recent decades have seen rapid advances in automatization processes supported by modern machines and computers The result is significant increases in system complexity and state changes information sources the need for faster data handling and the integration of environmental influences Intelligent systems equipped with a taxonomy of data driven system identification and machine learning algorithms can handle these problems partially Conventional learning algorithms in a batch off line setting fail whenever dynamic changes of the process appear due to non stationary environments and external influences Learning in Non Stationary Environments Methods and Applications offers a wide ranging comprehensive review of recent developments and important methodologies in the field The coverage focuses on dynamic learning in unsupervised problems dynamic learning in supervised classification and dynamic learning in supervised regression problems A later section is dedicated to applications in which dynamic learning methods serve as keystones for achieving models with high accuracy Rather than rely on a mathematical theorem proof style the editors highlight numerous figures tables examples and applications together with their explanations This approach offers a useful basis for further investigation and fresh ideas and motivates and inspires newcomers to explore this promising and still emerging field of research *Diagnostics and Prognostics of Engineering Systems: Methods and Techniques* Kadry, Seifedine,2012-09-30 Industrial Prognostics predicts an industrial system s lifespan using probability measurements to determine the way a machine operates Prognostics are essential in determining being able to predict and stop failures before they occur Therefore the development of dependable prognostic procedures for engineering systems is important to increase the system s performance and reliability Diagnostics and Prognostics of Engineering Systems Methods and Techniques provides widespread coverage and discussions on the methods and techniques of diagnosis and prognosis systems Including practical examples to display the method s effectiveness in real world applications as well as the latest trends and research this reference source aims to introduce fundamental theory and

practice for system diagnosis and prognosis

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