

Rolf Isermann



Fault-Diagnosis Applications

Model-based condition monitoring:
Actuators, drives, machinery,
plants, sensors, and
fault-tolerant systems

Fault Diagnosis Applications Fault Diagnosis Applications

Steven X. Ding



Fault Diagnosis Applications Fault Diagnosis Applications:

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 Fault Diagnosis Józef Korbicz, Jan M. Koscielny, Zdzisław Kowalczyk, Wojciech Cholewa, 2012-12-06 All real systems in nature physical biological and engineering ones can malfunction and fail due to faults in their components Logically the chances for malfunctions increase with the systems complexity The complexity of engineering systems is permanently growing due to their growing size and the degree of automation and accordingly increasing is the danger of failing and aggravating their impact for man and the environment Therefore in the design and operation of engineering systems increased attention has to be paid to reliability safety and fault tolerance But it is obvious that compared to the high standard of perfection that nature has achieved with its self healing and self repairing capabilities in complex biological organisms fault management in engineering systems is far behind the standards of their technological achievements it is still in its infancy and tremendous work is left to be done In technical control systems defects may happen in sensors actuators components of the controlled object the plant or in the hardware or software of the control framework Such defects in the components may develop into a failure of the whole system This effect can easily be amplified by the closed loop but the closed loop may also hide an incipient fault from being observed until a situation has occurred in which the failing of the whole system has become unavoidable

Fault-Diagnosis Applications Huaqing Wang, Ruitong Li, 2016 *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

Data-driven Design of Fault Diagnosis and Fault-tolerant Control Systems Steven X. Ding, 2014-04-12 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

Sensors Fault Diagnosis Trends and Applications Piotr Witczak, 2021-09-01 Fault diagnosis has always been a concern for industry In general diagnosis in complex systems requires the acquisition of information from sensors and the processing and extracting of required features for the classification or identification of faults Therefore fault diagnosis of sensors is clearly important as faulty information from a sensor may lead to misleading conclusions about the whole system As engineering systems grow in size and complexity it becomes more and more important to diagnose faulty behavior before it can lead to total failure In the light of above issues this book is dedicated to trends and applications in modern sensor fault diagnosis

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

Fault Diagnostics for Intelligent Vehicle Applications Ankur Ganguli,2004 Machine Learning: Concepts, Methodologies, Tools and Applications Management Association, Information Resources,2011-07-31 This reference offers a wide ranging selection of key research in a complex field of study discussing topics ranging from using machine learning to improve the effectiveness of agents and multi agent systems to developing machine learning software for high frequency trading in financial markets Provided by publishe

Computational Intelligence in Fault Diagnosis Vasile Palade,Cosmin Danut Bocaniala,2006-12-22 Presenting the latest developments and research results on fault diagnosis approaches using computational intelligence methodologies this book opens with a review of the state of the art before focusing on various theoretical aspects of computational intelligence methodologies applied to real world fault diagnosis problems Chapters deal with topics such as fuzzy sets applications to fault diagnosis neural network based fault diagnosis applications and neuro fuzzy techniques for fault diagnosis The last chapter considers the problem of diagnosing large scale complex systems using local agents which can be implemented using computational intelligence based fault diagnosis techniques Several case studies are used This book presents the most recent concerns and research results in industrial fault diagnosis using intelligent techniques and will be of interest to application engineers technologists graduates and researchers wishing to apply these techniques as well as build up a foundation for further study

A Hybrid Approach for Power Plant Fault Diagnostics Tamiru Alemu Lemma,2017-12-30 This book provides a hybrid approach to fault detection and diagnostics It presents a detailed analysis related to practical applications of the fault detection and diagnostics framework and highlights recent findings on power plant nonlinear model identification and fault diagnostics The effectiveness of the methods presented is tested using data acquired from actual cogeneration and cooling plants CCPs The models presented were developed by applying Neuro Fuzzy NF methods The book offers a valuable resource for researchers and practicing engineers alike

Advanced methods for fault diagnosis and fault-tolerant control Steven X. Ding,2020-11-24 The major objective of this book is to introduce advanced design and online optimization methods for fault diagnosis and fault tolerant control from different aspects Under the aspect of system types fault diagnosis and fault tolerant issues are dealt with for linear time invariant and time varying systems as well as for nonlinear and distributed including networked systems From the methodological point of view both model based and data driven schemes are investigated To allow for a self contained study and enable an easy implementation in real applications the necessary knowledge as well as tools in mathematics and control theory are included in this book The main results with the fault diagnosis and fault tolerant schemes are presented in form of algorithms and demonstrated by means of benchmark case studies The intended audience of this book are process and control engineers engineering students and researchers with control engineering background A

fault detection method for FADS system based on interval-valued neutrosophic sets, belief rule base, and D-S evidence reasoning Qianlei Jia, Jiayue Hu, Weiguo Zhang, Fault detection with the characteristics of strong uncertainty and randomness has always been one of the research hotspots in the field of aerospace. Considering that devices will inevitably encounter various unknown interference in the process of use which greatly limits the performance of many traditional fault detection methods. Therefore the main aim of this paper is to address this problem from the perspective of uncertainty and randomness of measurement signal. In information engineering interval valued neutrosophic sets IVNSs belief rule base BRB and Dempster Shafer D S evidence reasoning are always characterized by the strong ability in revealing uncertainty but each has its drawbacks. As a result the three theories are firstly combined in this paper to form a powerful fault detection algorithm. Besides a series of innovations are proposed to improve the method including a new score function based on p norm for IVNSs and a new approach of calculating the similarity between IVNSs which are both proved by authoritative prerequisites. To illustrate the effectiveness of the proposed method flush air data sensing FADS a technologically advanced airborne sensor is adopted in this paper. The aerodynamic model of FADS is analyzed in detail using knowledge of aerodynamics under subsonic and supersonic conditions meanwhile the high precision model is established based on the aerodynamic database obtained from CFD software.

Model-Based Fault Diagnosis Techniques Steven X. Ding, 2012-12-20 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.

Engineering Applications of Neural Networks John Macintyre, Lazaros Iliadis, Ilias Maglogiannis, Chrisina Jayne, 2019-05-14 This book constitutes the refereed proceedings of the 19th International Conference on Engineering Applications of Neural Networks EANN 2019 held in Xersonisos Crete Greece in May 2019. The 35 revised full papers and 5 revised short papers presented were carefully reviewed and selected from 72 submissions. The papers are organized in topical sections on AI in energy management industrial applications biomedical bioinformatics modeling classification learning deep learning deep learning convolutional

ANN fuzzy vulnerability navigation modeling machine learning modeling optimization ML DL financial modeling security anomaly detection 1st PEINT workshop Advanced Intelligent Computing Technology and Applications De-Shuang Huang,Zhanjun Si,Chuanlei Zhang,2024-08-01 This 6 volume set LNAI 14875 14880 constitutes in conjunction with the 13 volume set LNCS 14862 14874 and the 2 volume set LNBI 14881 14882 the refereed proceedings of the 20th International Conference on Intelligent Computing ICIC 2024 held in Tianjin China during August 5 8 2024 The total of 863 regular papers were carefully reviewed and selected from 2189 submissions The intelligent computing annual conference primarily aims to promote research development and application of advanced intelligent computing techniques by providing a vibrant and effective forum across a variety of disciplines This conference has a further aim of increasing the awareness of industry of advanced intelligent computing techniques and the economic benefits that can be gained by implementing them The intelligent computing technology includes a range of techniques such as Artificial Intelligence Pattern Recognition Evolutionary Computing Informatics Theories and Applications Computational Neuroscience Bioscience Soft Computing Human Computer Interface Issues etc *Applications of Artificial Intelligence in Process Systems Engineering* Jingzheng Ren,Weifeng Shen,Yi Man,Lichun Dong,2021-06-05 Applications of Artificial Intelligence in Process Systems Engineering offers a broad perspective on the issues related to artificial intelligence technologies and their applications in chemical and process engineering The book comprehensively introduces the methodology and applications of AI technologies in process systems engineering making it an indispensable reference for researchers and students As chemical processes and systems are usually non linear and complex thus making it challenging to apply AI methods and technologies this book is an ideal resource on emerging areas such as cloud computing big data the industrial Internet of Things and deep learning With process systems engineering s potential to become one of the driving forces for the development of AI technologies this book covers all the right bases Explains the concept of machine learning deep learning and state of the art intelligent algorithms Discusses AI based applications in process modeling and simulation process integration and optimization process control and fault detection and diagnosis Gives direction to future development trends of AI technologies in chemical and process engineering **Fault Diagnosis and Fault-Tolerant Control Based on Adaptive Control Approach** Qikun Shen,Bin Jiang,Peng Shi,2017-02-14 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 **Advanced and Intelligent Computations in Diagnosis and Control** Zdzisław Kowalczyk, 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 2013 International Conference on Computer Science and Artificial Intelligence Dr. Yuetong Lin, Dr. Gabriel Alungbe, 2014-11-16 The main objective of ICCSAI2013 is to provide a platform for the presentation of top and latest research results in global scientific areas The conference aims to provide a high level international forum for researcher engineers and practitioners to present and discuss recent advances and new techniques in computer science and artificial intelligence It also serves to foster communications among researcher engineers and practitioners working in a common interest in improving computer science artificial intelligence and the related fields We have received 325 numbers of papers through Call for Paper out of which 94 numbers of papers were accepted for publication in the conference proceedings through double blind review process The conference is designed to stimulate the young minds including Research Scholars Academicians and Practitioners to contribute their ideas thoughts and nobility in these two disciplines

The book delves into Fault Diagnosis Applications Fault Diagnosis Applications. Fault Diagnosis Applications Fault Diagnosis Applications is an essential topic that must be grasped by everyone, ranging from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Fault Diagnosis Applications Fault Diagnosis Applications, encompassing both the fundamentals and more intricate discussions.

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 5. In chapter 4, this book will scrutinize the relevance of Fault Diagnosis Applications Fault Diagnosis Applications in specific contexts. The fourth chapter will explore how Fault Diagnosis Applications Fault Diagnosis Applications is applied in specialized fields, such as education, business, and technology.
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- This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Fault Diagnosis Applications Fault Diagnosis Applications.

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