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Robust Stability and Performance Analysis of Large Scale Power Systems with Parametric Uncertainty

A Structured Singular Value Approach

Nova Science Pub Incorporated This book deals with the application of new techniques based on multivariable control theory and optimisation theory to the study of robust stability of highly uncertain models of large interconnected power systems subject to real parameter variations. It focuses on the study of robust stability problems associated with parameter variations representing real physical quantities. The objective is to verify that critical system controllers of complex systems remain stable and achieve desired performance objectives for all predefined power system variations at selected operating conditions along its expected operating trajectory. A second related objective is to determine the stability robustness with respect to changes in power system parameters and the maximum loading condition for which the system will remain stable.

Renewables in Future Power Systems

Implications of Technological Learning and Uncertainty

Springer Science & Business Media The book examines the future deployment of renewable power from a normative point of view. It identifies properties characterizing the cost-optimal transition towards a renewable power system and analyzes the key drivers behind this transition. Among those drivers, particular attention is paid to technological cost reductions and the implications of uncertainty. From a methodological perspective, the main contributions of this book relate to the field of endogenous learning and uncertainty in optimizing energy system models. The primary objective here is closing the gap between the strand of literature covering renewable potential analyses on the one side and energy system modeling with endogenous technological change on the other side. The models applied in this book demonstrate that fundamental changes must occur to transform today's power sector into a more sustainable one over the course of this century. Apart from its methodological contributions, this work is also intended to provide practically relevant insights regarding the long-term competitiveness of renewable power generation.

Power System Loads and Power System Stability

Springer Nature This thesis develops a pioneering methodology and a concept for identifying critical loads and load model parameters in large power networks based on their influence on power system stability. The research described in the thesis first develops an automatic load modelling tool (ALMT) that can be used to automatically build load model from actual measured power system data without human intervention and the benefits of the ALMY are explored. Secondly, it develops a pioneering framework based on Morris screening method for ranking power system load model parameters based on their influence on overall power system stability (voltage, frequency, transient and small disturbance stability) considering different load models and loading conditions. Thirdly, a novel probabilistic methodology for determining the accuracy levels of critical load model parameters has been developed. This book will be of interest to students and researchers within the field of electrical engineering, as well as industry professionals.

Integration of Large-Scale Renewable Energy into Bulk Power Systems

From Planning to Operation

Springer This book outlines the challenges that increasing amounts of renewable and distributed energy represent when integrated into established electricity grid infrastructures, offering a range of potential solutions that will support engineers, grid operators, system planners, utilities, and policymakers alike in their efforts to realize the vision of moving toward greener, more secure energy portfolios. Covering all major renewable sources, from wind and solar, to waste energy and hydropower, the authors highlight case studies of successful integration scenarios to demonstrate pathways toward overcoming the complexities created by variable and distributed generation.

Efficient Modeling and Control of Large-Scale Systems

Springer Science & Business Media Complexity and dynamic order of controlled engineering systems is constantly increasing. Complex large scale systems (where "large" reflects the system's order and not necessarily its physical size) appear in many engineering fields, such as micro-electromechanics, manufacturing, aerospace, civil engineering and power engineering. Modeling of these systems often result in very high-order models imposing great challenges to the analysis, design and control problems. "Efficient Modeling and Control of Large-Scale Systems" compiles state-of-the-art contributions on recent analytical and computational methods for addressing model reduction, performance analysis and feedback control design for such systems. Also addressed at length are new theoretical developments, novel computational approaches and illustrative applications to various fields, along with: - An interdisciplinary focus emphasizing methods and approaches that can be commonly applied in various engineering fields - Examinations of applications in various fields including micro-electromechanical systems (MEMS), manufacturing processes, power networks, traffic control "Efficient Modeling and Control of Large-Scale Systems" is an ideal volume for engineers and researchers working in the fields of control and dynamic systems.

Intelligent Renewable Energy Systems

Modelling and Control

Springer 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 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.

Applications of Advanced Control and Artificial Intelligence in Smart Grids

Frontiers Media SA

DOE/RA.

Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems

John Wiley & Sons In control theory, sliding mode control (SMC) is a nonlinear control method that alters the dynamics of a nonlinear system by application of a discontinuous control signal that forces the system to slide along a cross-section of the system's normal behaviour. In recent years, SMC has been successfully applied to a wide variety of practical engineering systems including robot manipulators, aircraft, underwater vehicles, spacecraft, flexible space structures, electrical motors, power systems, and automotive engines. Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems addresses the increasing demand for developing SMC technologies and comprehensively presents the new, state-of-the-art sliding mode control methodologies for uncertain parameter-switching hybrid systems. It establishes a unified framework for SMC of Markovian jump singular systems and proposes new SMC methodologies based on the analysis results. A series of problems are solved with new approaches for analysis and synthesis of switched hybrid systems, including stability analysis and stabilization, dynamic output feedback control, and SMC. A set of newly developed techniques (e.g. average dwell time, piecewise Lyapunov function, parameter-dependent Lyapunov function, cone complementary linearization) are exploited to handle the emerging mathematical/computational challenges. Key features: Covers new concepts, new models and new methodologies with theoretical significance in system analysis and control synthesis Includes recent advances in Markovian jump systems, switched hybrid systems, singular systems, stochastic systems and time-delay systems

Includes solved problems Introduces advanced techniques Sliding Mode Control of Uncertain Parameter-Switching Hybrid Systems is a comprehensive reference for researchers and practitioners working in control engineering, system sciences and applied mathematics, and is also a useful source of information for senior undergraduate and graduates studying in these areas.

Optimisation Models and Methods in Energy Systems

MDPI This book is a printed edition of the Special Issue Optimisation Models and Methods in Energy Systems that was published in Energies

Robust Optimal Planning and Operation of Electrical Energy Systems

Springer This book discusses the recent developments in robust optimization (RO) and information gap design theory (IGDT) methods and their application for the optimal planning and operation of electric energy systems. Chapters cover both theoretical background and applications to address common uncertainty factors such as load variation, power market price, and power generation of renewable energy sources. Case studies with real-world applications are included to help undergraduate and graduate students, researchers and engineers solve robust power and energy optimization problems and provide effective and promising solutions for the robust planning and operation of electric energy systems.

Sustainable Energy Systems: From Primary to End-Use

MDPI This book focuses on sustainable energy systems. While several innovative and alternative concepts are presented, the topics of energy policy, life cycle assessment, thermal energy, and renewable energy also play a major role. Models on various temporal and geographical scales are developed to understand the conditions of technical as well as organizational change. New methods of modeling, which can fulfil technical and physical boundary conditions and nevertheless consider economic environmental and social aspects, are also developed.

Fuzzy Control and Filter Design for Uncertain Fuzzy Systems

Springer Most real physical systems are nonlinear in nature. Control and filtering of nonlinear systems are still open problems due to their complexity natures. These problem becomes more complex when the system's parameters are - certain. A common approach to designing a controller/filter for an uncertain nonlinear system is to linearize the system about an operating point, and uses linear control theory to design a controller/filter. This approach is successful when the operating point of the system is restricted to a certain region. However, when a wide range operation of the system is required, this method may fail. This book presents new novel methodologies for designing robust fuzzy controllers and robust fuzzy filters for a class of uncertain fuzzy systems (UFSs), uncertain fuzzy Markovian jump systems (UFMJSs), uncertain fuzzy singularly perturbed systems (UFSPSs) and uncertain fuzzy singularly p- turbed systems with Markovian jumps (UFSPS-MJs). These new methodologies provide a framework for designing robust fuzzy controllers and robust fuzzy filters for these classes of systems based on a Takagi-Sugeno (TS) fuzzy model. Solutions to the design problems are presented in terms of linear matrix inequalities (LMIs). To investigate the design problems, we first describe a class of uncertain nonlinear systems (UNs), uncertain nonlinear Markovian jump systems (UNMJSs), uncertain nonlinear singularly perturbed systems (UNSPSs) and uncertain nonlinear singularly perturbed systems with Markovian jumps (UNSPS-MJs) by a TS fuzzy system with parametric - certainties and with/without Markovian jumps. Then, based on an LMI - proach, we develop a technique for designing robust fuzzy controllers and robust fuzzy filters such that a given prescribed performance index is guaranteed.

Integration of Distributed Resources in Smart Grids for Demand Response and Transactive Energy

A Case Study of TCLs

Springer Nature The proliferation of renewable energy enhances the sustainability of power systems, but the inherent variability also poses great challenges to the planning and operation of large power grids. The corresponding electric power deficiencies can be compensated by fast ramping generators and energy storage devices. However, frequent ramp up/down power adjustments can increase the operation and the maintenance cost of generators. Moreover, storage devices are regarded as costly alternatives. Demand response (DR) and transactive energy can address this problem owing to its attractive and versatile capability for balancing the supply-demand, improving energy efficiency, and enhancing system resilience. Distributed resources are the typical participants of DR and transactive energy programs, which greatly contribute to keep the supply and demand in a balance. Thermostatically controlled loads (TCLs) (i.e., air conditioners, water heaters, and refrigerators) represent an example of distributed resources, the ratio of which to the total power consumption in developed countries is up to 30%-40%. Providing tremendous potentials in adjustable power consumption, TCLs have attracted major interests in DR and transactive energy opportunities. It has highlighted the advantages of TCLs in responding to uncertainties in power systems. This book provides an insight of TCLs as typical distributed resources in smart grids for demand response and transactive energy to address the imbalance between supply and demand problems in power systems. The key points on analysis of uncertainty parameters, aggregated control models, battery modelling, multi-time scale control, transactive control and robust restoration of TCLs are all included. These are the research points of smart grids and deserve much attention. We believe this book will offer the related researcher a better understanding on the integration of distributed resources into smart grid for demand response and transactive energy. And it will be helpful to address the problems in practical projects.

Optimization of Power System Operation

John Wiley & Sons

Analytic Research Foundations for the Next-Generation

Electric Grid

National Academies Press Electricity is the lifeblood of modern society, and for the vast majority of people that electricity is obtained from large, interconnected power grids. However, the grid that was developed in the 20th century, and the incremental improvements made since then, including its underlying analytic foundations, is no longer adequate to completely meet the needs of the 21st century. The next-generation electric grid must be more flexible and resilient. While fossil fuels will have their place for decades to come, the grid of the future will need to accommodate a wider mix of more intermittent generating sources such as wind and distributed solar photovoltaics. Achieving this grid of the future will require effort on several fronts. There is a need for continued shorter-term engineering research and development, building on the existing analytic foundations for the grid. But there is also a need for more fundamental research to expand these analytic foundations. Analytic Research Foundations for the Next-Generation Electric Grid provide guidance on the longer-term critical areas for research in mathematical and computational sciences that is needed for the next-generation grid. It offers recommendations that are designed to help direct future research as the grid evolves and to give the nation's research and development infrastructure the tools it needs to effectively develop, test, and use this research.

NASA LaRC Workshop on Guidance, Navigation, Controls, and Dynamics for Atmospheric Flight, 1993

Proceedings of the Joint Automatic Control Conference Control of Complex Systems

Structural Constraints and Uncertainty

Springer Science & Business Media "Control of Complex Systems: Structural Constraints and Uncertainty" focuses on control design under information structure constraints, with a particular emphasis on large-scale systems. The complexity of such systems poses serious computational challenges and severely restricts the types of feedback laws that can be used in practice. This book systematically addresses the main issues, and provides a number of applications that illustrate potential design methods, most which use Linear Matrix Inequalities (LMIs), which have become a popular design tool over the past two decades. Authors Aleksandar I. Zecevic and Dragoslav D. Siljak use their years of experience in the control field to also: Address the issues of large-scale systems as they relate to robust control and linear matrix inequalities Discuss a new approach to applying standard LMI techniques to large-scale systems, combining graphic-theoretic decomposition techniques with appropriate low-rank numerical approximations and dramatically reducing the computational effort Providing numerous examples and a wide variety of applications, ranging from electric power systems and nonlinear circuits to mechanical problems and dynamic Boolean networks "Control of Complex Systems: Structural Constraints and Uncertainty" will appeal to practicing engineers, researchers and students working in control design and other related areas.

Proceedings of the Fifth Euro-China Conference on Intelligent Data Analysis and Applications

Springer This volume of Advances in Intelligent Systems and Computing highlights papers presented at the Fifth Euro-China Conference on Intelligent Data Analysis and Applications (ECC2018), held in Xi'an, China from October 12 to 14 2018. The conference was co-sponsored by Springer, Xi'an University of Posts and Telecommunications, VSB Technical University of Ostrava (Czech Republic), Fujian University of Technology, Fujian Provincial Key Laboratory of Digital Equipment, Fujian Provincial Key Lab of Big Data Mining and Applications, and Shandong University of Science and Technology in China. The conference was intended as an international forum for researchers and professionals engaged in all areas of computational intelligence, intelligent control, intelligent data analysis, pattern recognition, intelligent information processing, and applications.

Large Space Structures & Systems in the Space Station Era

A Bibliography with Indexes

Large-Scale System Analysis Under Uncertainty With Electric Power Applications

Cambridge University Press Discover a comprehensive set of tools and techniques for analyzing the impact of uncertainty on large-scale engineered systems. Providing accessible yet rigorous coverage, it showcases the theory through detailed case studies drawn from electric power application problems, including the impact of integration of renewable-based power generation in bulk power systems, the impact of corrupted measurement and communication devices in microgrid closed-loop controls, and the impact of components failures on the reliability of power supply systems. The case studies also serve as a guide on how to tackle similar problems that appear in other engineering application domains, including automotive and aerospace engineering. This is essential reading for academic researchers and graduate students in power systems engineering, and dynamic systems and control engineering.

Methods in Systems Biology

Academic Press Systems biology is a term used to describe a number of trends in bioscience research and a movement that draws on those trends. This volume in the Methods in Enzymology series comprehensively covers the methods in systems biology. With an international board of authors, this volume is split into sections that cover subjects such as machines for systems biology, protein production and quantification for systems biology, and enzymatic assays in systems biology research. This volume in the Methods in Enzymology series comprehensively covers the methods in systems biology With an international board of authors, this volume is split

into sections that cover subjects such as machines for systems biology, protein production and quantification for systems biology, and enzymatic assays in systems biology research

Simulation of Distributed-parameter and Large-scale Systems

Proceedings of the IMACS European Simulation Meeting on Simulation of Distributed-Parameter and Large-Scale Systems, University of Patras, Patras, Greece, October 2-4, 1979

North-Holland

Intelligent Control in Energy Systems

MDPI The editors of this Special Issue titled "Intelligent Control in Energy Systems" have attempted to create a book containing original technical articles addressing various elements of intelligent control in energy systems. In response to our call for papers, we received 60 submissions. Of those submissions, 27 were published and 33 were rejected. In this book, we offer the 27 accepted technical articles as well as one editorial. Authors from 15 countries (China, Netherlands, Spain, Tunisia, United States of America, Korea, Brazil, Egypt, Denmark, Indonesia, Oman, Canada, Algeria, Mexico, and the Czech Republic) elaborate on several aspects of intelligent control in energy systems. The book covers a broad range of topics including fuzzy PID in automotive fuel cell and MPPT tracking, neural networks for fuel cell control and dynamic optimization of energy management, adaptive control on power systems, hierarchical Petri Nets in microgrid management, model predictive control for electric vehicle battery and frequency regulation in

HVAC systems, deep learning for power consumption forecasting, decision trees for wind systems, risk analysis for demand side management, finite state automata for HVAC control, robust μ -synthesis for microgrids, and neuro-fuzzy systems in energy storage.

Data Science in Engineering, Volume 9

Proceedings of the 39th IMAC, A Conference and Exposition on Structural Dynamics 2021

Springer Nature Data Science and Engineering Volume 9: Proceedings of the 39th IMAC, A Conference and Exposition on Structural Dynamics, 2021, the ninth volume of nine from the Conference, brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Data Science in Engineering, including papers on: Data Science in Engineering Applications Engineering Mathematics Computational Methods in Engineering

Smart Grid Handbook, 3 Volume Set

John Wiley & Sons Comprehensive, cross-disciplinary coverage of Smart Grid issues from global expert researchers and practitioners. This definitive reference meets the need for a large scale, high quality work reference in Smart Grid engineering which is pivotal in the development of a low-carbon energy infrastructure. Including a total of 83 articles across 3 volumes The Smart Grid Handbook is organized in to 6 sections: Vision and Drivers, Transmission, Distribution, Smart Meters and Customers, Information and Communications Technology, and Socio-Economic Issues. Key features: Written by a team representing smart grid R&D, technology deployment, standards, industry practice, and socio-economic aspects. Vision and Drivers covers the vision, definitions, evolution, and global development of the smart grid as well as new technologies and standards. The Transmission section discusses industry practice, operational experience, standards, cyber security, and grid codes. The Distribution section introduces distribution systems and the system configurations in different countries and different load areas served by the grid. The Smart Meters and Customers section assesses how smart meters enable the customers to interact with the power grid. Socio-economic issues and information and communications technology requirements are covered in dedicated articles. The Smart Grid Handbook will meet the need for a high

quality reference work to support advanced study and research in the field of electrical power generation, transmission and distribution. It will be an essential reference for regulators and government officials, testing laboratories and certification organizations, and engineers and researchers in Smart Grid-related industries.

Process Systems Engineering For a Smooth Energy Transition

Walter de Gruyter GmbH & Co KG Process systems engineering (PSE) is a discipline that delivers tools for guided decision-making in the development of new processes and products. Proven successful in the pharmaceutical-, food- and water sectors, it has also breached the field of energy systems. The future energy systems aim to be more efficient, cost-effective, environmentally benign, and interconnected. The design and operation is extremely challenging for decision-makers, engineers, and scientists and here lies a crucial role for the process systems engineer.

Bifurcation Control Theory and Applications

Springer Science & Business Media Bifurcation control refers to the task of designing a controller that can modify the bifurcation properties of a given nonlinear system, so as to achieve some desirable dynamical behaviors. There exists no similar control theory-oriented book available in the market that is devoted to the subject of bifurcation control, written by control engineers for control engineers. World-renowned leading experts in the field provide their state-of-the-art survey about the extensive research that has been done over the last few years in this subject. The book is not only aimed at active researchers in the field of bifurcation control and its applications, but also at a general audience in related fields.

Technology for Large Space Systems

Supplement

Robustness Analysis in Decision Aiding, Optimization, and Analytics

Springer This book provides a broad coverage of the recent advances in robustness analysis in decision aiding, optimization, and analytics. It offers a comprehensive illustration of the challenges that robustness raises in different operations research and management science (OR/MS) contexts and the methodologies proposed from multiple perspectives. Aside from covering recent methodological developments, this volume also features applications of robust techniques in engineering and management, thus illustrating the robustness issues raised in real-world problems and their resolution within advances in OR/MS methodologies. Robustness analysis seeks to address issues by promoting solutions, which are acceptable under a wide set of hypotheses, assumptions and estimates. In OR/MS, robustness has been mostly viewed in the context of optimization under uncertainty. Several scholars, however, have emphasized the multiple facets of robustness analysis in a broader OR/MS perspective that goes beyond the traditional framework, seeking to cover the decision support nature of OR/MS methodologies as well. As new challenges emerge in a "big-data" era, where the information volume, speed of flow, and complexity increase rapidly, and analytics play a fundamental role for strategic and operational decision-making at a global level, robustness issues such as the ones covered in this book become more relevant than ever for providing sound decision support through more powerful analytic tools.

Sustainable Energy Systems Planning, Integration and

Management

MDPI Energy systems worldwide are undergoing major transformation as a consequence of the transition towards the widespread use of clean and sustainable energy sources. Basically, this involves massive changes in technical and organizational levels together with tremendous technological upgrades in different sectors ranging from energy generation and transmission systems down to distribution systems. These actions generate huge science and engineering challenges and demands for expert knowledge in the field to create solutions for a sustainable energy system that is economically, environmentally, and socially viable while meeting high security requirements. This book covers these promising and dynamic areas of research and development, and presents contributions in sustainable energy systems planning, integration, and management. Moreover, the book elaborates on a variety of topics, ranging from design and planning of small- to large-scale energy systems to the operation and control of energy networks in different sectors, namely electricity, heat, and transport.

Modeling, Design, and Simulation of Systems with Uncertainties

Springer Science & Business Media To describe the true behavior of most real-world systems with sufficient accuracy, engineers have to overcome difficulties arising from their lack of knowledge about certain parts of a process or from the impossibility of characterizing it with absolute certainty. Depending on the application at hand, uncertainties in modeling and measurements can be represented in different ways. For example, bounded uncertainties can be described by intervals, affine forms or general polynomial enclosures such as Taylor models, whereas stochastic uncertainties can be characterized in the form of a distribution described, for example, by the mean value, the standard deviation and higher-order moments. The goal of this Special Volume on Modeling, Design, and Simulation of Systems with Uncertainties is to cover modern methods for dealing with the challenges presented by imprecise or unavailable information. All contributions tackle the topic from the point of view of control, state and parameter estimation, optimization and simulation. Thematically, this volume can be divided into two parts. In the first we present works highlighting the theoretic background and current research on algorithmic approaches in the field of uncertainty handling, together with their reliable software implementation. The second part is concerned with real-life application scenarios from various areas including but not limited to mechatronics, robotics, and biomedical engineering.

Alternative Sources of Energy Modeling and Automation

MDPI Micro-power domestic organic Rankine cycle (ORC) systems and the selection of the expander and the working fluid are presented, analyzed thoroughly, and numerically evaluated. A promising decentralized hybrid PV-SOFC system is investigated for providing useful energy supply to commercial buildings, capable of power and heat generation at a lower cost. A hybrid solar-combined cycle power plant integrated with a packed-bed thermal energy storage system with a novel recycling configuration enables robust control of collector temperature and net power during times of high solar activity. An automated hybrid (solar and biomass) power plant for thermal energy production for indoor space heating loads coverage is presented. A comprehensive and up-to-date literature review is presented of non-iterative methods for the extraction of the single diode model parameters of photovoltaic modules. A prototype custom built two-speed gearbox with a single stage transmission electric vehicle achieves significant reductions in the overall energy consumption. Two new fuzzy models are presented of high concentrator photovoltaics using the high-accuracy Takagi-Sugeno-Kang approach and the ease of interpreting the Mamdani linguistic rules. Finally, the impact of plug-in hybrid electric vehicles (PHEVs) in the primary frequency regulation is studied and the effects of PHEVs in non-interconnected isolated power systems with significant renewable energy source (RES) penetration are demonstrated through simulations of the isolated power system of Cyprus Island.

Library of Congress Subject Headings

Decentralized Systems with Design Constraints

Springer Science & Business Media Decentralized Control and Filtering provides a rigorous framework for examining the analysis, stability and control of large-scale systems, addressing the difficulties that arise because dimensionality, information structure constraints, parametric uncertainty and time-delays. This monograph serves three purposes: it reviews past methods and results from a contemporary perspective; it examines presents trends and approaches and to provide future possibilities; and it investigates robust, reliable and/or resilient decentralized design methods based on a framework of linear matrix inequalities. As well as providing an overview of large-scale systems theories from the past several decades, the author presents key modern concepts and efficient computational methods. Representative numerical examples, end-of-chapter problems, and typical system applications are included,

and theoretical developments and practical applications of large-scale dynamical systems are discussed in depth.

Electric Distribution Network Planning

Springer This book highlights the latest research advances in the planning and management of electric distribution networks. It addresses various aspects of distribution network management including planning, operation, customer engagement, and technology accommodation. Given the importance of electric distribution networks in power delivery systems, effectively planning and managing them are vital to satisfying technical, economic, and customer requirements. A new planning and management philosophy, techniques, and methods are essential to handling uncertainties associated with the integration of renewable-based distributed generation, demand forecast, and customer needs. This book covers topics on managing the capacity of distribution networks, while also addressing the future needs of electric systems. The efficient and economical operation of distribution networks is an essential aspect of ensuring the effective use of resources. Accordingly, this book addresses operation and control approaches and techniques suitable for future distribution networks.

The Summary of Engineering Research

Embedded Software and Systems

First International Conference, ICESS 2004, Hangzhou, China, December 9-10, 2004, Revised Selected Papers

Springer Welcome to the post proceedings of the First International Conference on Embedded Software and Systems (ICISS 2004), which was held in Hangzhou, P. R. China, 9-10 December 2004. Embedded Software and Systems technology is of increasing importance for a wide range of industrial areas, such as aerospace, automotive, telecommunication, and manufacturing automation. Embedded technology is playing an increasingly dominant role in modern society. This is a natural outcome of amazingly fast developments in the embedded field. The ICESS 2004 conference brought together researchers and developers from academia,

industry, and government to advance the science, engineering, and technology in embedded software and systems development, and provided them with a forum to present and exchange their ideas, results, work in progress, and experience in all areas of embedded systems research and development. The ICESS 2004 conference attracted much more interest than expected. The total number of paper submissions to the main conference and its three workshops, namely, Pervasive Computing, Automobile Electronics and Telecommunication, was almost 400, from nearly 20 countries and regions. All submissions were reviewed by at least three Program or Technical Committee members or external reviewers. It was extremely difficult to make the final decision on paper acceptance because there were so many excellent, foreseeing, and interesting submissions with brilliant ideas.

Data Fusion and Data Mining for Power System Monitoring

CRC Press Data Fusion and Data Mining for Power System Monitoring provides a comprehensive treatment of advanced data fusion and data mining techniques for power system monitoring with focus on use of synchronized phasor networks. Relevant statistical data mining techniques are given, and efficient methods to cluster and visualize data collected from multiple sensors are discussed. Both linear and nonlinear data-driven mining and fusion techniques are reviewed, with emphasis on the analysis and visualization of massive distributed data sets. Challenges involved in realistic monitoring, visualization, and analysis of observation data from actual events are also emphasized, supported by examples of relevant applications. Features Focuses on systematic illustration of data mining and fusion in power systems Covers issues of standards used in the power industry for data mining and data analytics Applications to a wide range of power networks are provided including distribution and transmission networks Provides holistic approach to the problem of data mining and data fusion using cutting-edge methodologies and technologies Includes applications to massive spatiotemporal data from simulations and actual events