# Optimal Charging Control Of Electric Vehicles In Smart Grids Springerbriefs In Electrical And Computer Engineering

Introduction to Hybrid Vehicle System Modeling and ControlHybrid Electric Vehicle System Modeling and ControlBattery Management Systems, Volume I: Battery ModelingSmart Cities TechnologiesAdvanced Battery Management Technologies for Electric VehiclesPlanning and Operation of Plug-in Electric VehiclesElectromechanical Control Technology and TransportationModeling and Simulation for Electric Vehicle ApplicationsOptimal Flexibility Allocation in Electrical Distribution GridsTechnologies and Applications for Smart Charging of Electric and Plug-in Hybrid VehiclesVehicle Propulsion SystemsDistributed Control Methods and Cyber Security Issues in MicrogridsDevelopment and Integration of MicrogridsCarbon Dioxide Capture and StorageGrid Integration of Electric Vehicles in Open Electricity MarketsEnergy Management of Distributed Generation SystemsFundamentals and Applications of Lithium-ion Batteries in Electric Drive VehiclesCyber-physical Systems and Digital TwinsNew Trends in Electrical Vehicle PowertrainsModeling, Dynamics, and Control of Electrified VehiclesControl and Optimization Methods for Electric Smart GridsBattery Management Algorithm for Electric VehiclesGrid Optimal Integration of Electric Vehicles: Examples with Matlab Implementation2020 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT)Plug-in Electric Vehicle Grid IntegrationHybrid Electric Vehicles2020 17th International Conference on the European Energy Market (EEM)Energy Efficiency Improvements in Smart Grid ComponentsIntelligent Control of Connected Plug-in Hybrid Electric VehiclesPlug In Electric Vehicles in Smart GridsOvercoming Barriers to Deployment of Plug-in Electric VehiclesOptimal Charging Control of Electric Vehicles in Smart GridsDependability in Sensor, Cloud, and Big Data Systems and ApplicationsMobile Electric VehiclesTechnological Innovation for the Internet of ThingsAdvanced Computational Methods in Energy, Power, Electric Vehicles, and Their IntegrationEnergy Storage and Management for Electric VehiclesDecentralized Charging Coordination of Large-scale Plug-in Electric Vehicles in Power SystemsElectric Vehicles in Energy SystemsOptimization, Learning, and Control for Interdependent Complex Networks

## Introduction to Hybrid Vehicle System Modeling and Control

Intelligent Control of Connected Plug-in Hybrid Electric Vehicles presents the development of real-time intelligent control systems for plug-in hybrid electric vehicles, which involves control-oriented modelling, controller design, and performance evaluation. The controllers outlined in the book take advantage of advances in vehicle communications technologies, such as global positioning systems, intelligent transportation systems, geographic information systems, and other on-board sensors, in order to provide look-ahead trip data. The book contains simple and efficient models and fast optimization algorithms for the devised controllers to address the challenge of real-time implementation in the design of complex control

systems. Using the look-ahead trip information, the authors of the book propose intelligent optimal model-based control systems to minimize the total energy cost, for both grid-derived electricity and fuel. The multilayer intelligent control system proposed consists of trip planning, an ecological cruise controller, and a route-based energy management system. An algorithm that is designed to take advantage of previewed trip information to optimize battery depletion profiles is presented in the book. Different control strategies are compared and ways in which connecting vehicles via vehicle-to-vehicle communication can improve system performance are detailed. Intelligent Control of Connected Plug-in Hybrid Electric Vehicles is a useful source of information for postgraduate students and researchers in academic institutions participating in automotive research activities. Engineers and designers working in research and development for automotive companies will also find this book of interest. Advances in Industrial Control reports and encourages 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.

## Hybrid Electric Vehicle System Modeling and Control

The book contains 10 chapters, and it is divided into four sections. The first section includes three chapters, providing an overview of Energy Management of Distributed Systems. It outlines typical concepts, such as Demand-Side Management, Demand Response, Distributed, and Hierarchical Control for Smart Micro-Grids. The second section contains three chapters and presents different control algorithms, software architectures, and simulation tools dedicated to Energy Management Systems. In the third section, the importance and the role of energy storage technology in a Distribution System, describing and comparing different types of energy storage systems, is shown. The fourth section shows how to identify and address potential threats for a Home Energy Management System. Finally, the fifth section discusses about Economical Optimization of Operational Cost for Micro-Grids, pointing out the effect of renewable energy sources, active loads, and energy storage systems on economic operation.

## Battery Management Systems, Volume I: Battery Modeling

In the past few years, interest in plug-in electric vehicles (PEVs) has grown. Advances in battery and other technologies, new federal standards for carbon-dioxide emissions and fuel economy, state zero-emission-vehicle requirements, and the current administration's goal of putting millions of alternative-fuel vehicles on the road have all highlighted PEVs as a transportation alternative. Consumers are also beginning to recognize the advantages of PEVs over conventional vehicles, such as lower operating costs, smoother operation, and better acceleration; the ability to fuel up at home; and zero tailpipe emissions when the vehicle operates solely on its battery. There are, however, barriers to PEV deployment, including the

vehicle cost, the short all-electric driving range, the long battery charging time, uncertainties about battery life, the few choices of vehicle models, and the need for a charging infrastructure to support PEVs. What should industry do to improve the performance of PEVs and make them more attractive to consumers? At the request of Congress, Overcoming Barriers to Deployment of Plug-in Electric Vehicles identifies barriers to the introduction of electric vehicles and recommends ways to mitigate these barriers. This report examines the characteristics and capabilities of electric vehicle technologies, such as cost, performance, range, safety, and durability, and assesses how these factors might create barriers to widespread deployment. Overcoming Barriers to Deployment of Plug-in Electric Vehicles provides an overview of the current status of PEVs and makes recommendations to spur the industry and increase the attractiveness of this promising technology for consumers. Through consideration of consumer behaviors, tax incentives, business models, incentive programs, and infrastructure needs, this book studies the state of the industry and makes recommendations to further its development and acceptance.

## Smart Cities Technologies

Distributed Control and Cyber Security Issues in Microgrids presents a thorough treatment of distributed control methods and cyber security issues for power system researchers and engineers. With the help of mathematical tools, this reference gives a deep understanding of microgrids and new research directions, addressing emerging concepts, methodologies and applications of monitoring, control and protection in smart microgrids with large-scale renewables. With the integration of more distributed or aggregated renewables and the wide utilization of power electronic devices, the smart microgrid is facing new stability and security challenges. Includes global case studies to demonstrate distributed control success stories Offers detailed illustrations and flowcharts to address challenges and technical solutions for those working in power systems in utilities and industry Showcases new challenges faced in the stability and security of smart microgrids

## Advanced Battery Management Technologies for Electric Vehicles

Large-scale battery packs are needed in hybrid and electric vehicles, utilities grid backup and storage, and frequency-regulation applications. In order to maximize battery-pack safety, longevity, and performance, it is important to understand how battery cells work. This first of its kind new resource focuses on developing a mathematical understanding of how electrochemical (battery) cells work, both internally and externally. This comprehensive resource derives physics-based micro-scale model equations, then continuum-scale model equations, and finally reduced-order model equations. This book describes the commonly used equivalent-circuit type battery model and develops equations for superior physics-based models of lithium-ion cells at different length scales. This resource also presents a breakthrough technology called the “discrete-time realization algorithm” that automatically converts physics-based models into high-fidelity approximate

reduced-order models.

## Planning and Operation of Plug-in Electric Vehicles

A comprehensive examination of advanced battery management technologies and practices in modern electric vehicles Policies surrounding energy sustainability and environmental impact have become of increasing interest to governments, industries, and the general public worldwide. Policies embracing strategies that reduce fossil fuel dependency and greenhouse gas emissions have driven the widespread adoption of electric vehicles (EVs), including hybrid electric vehicles (HEVs), pure electric vehicles (PEVs) and plug-in electric vehicles (PHEVs). Battery management systems (BMSs) are crucial components of such vehicles, protecting a battery system from operating outside its Safe Operating Area (SOA), monitoring its working conditions, calculating and reporting its states, and charging and balancing the battery system. Advanced Battery Management Technologies for Electric Vehicles is a compilation of contemporary model-based state estimation methods and battery charging and balancing techniques, providing readers with practical knowledge of both fundamental concepts and practical applications. This timely and highly-relevant text covers essential areas such as battery modeling and battery state of charge, energy, health and power estimation methods. Clear and accurate background information, relevant case studies, chapter summaries, and reference citations help readers to fully comprehend each topic in a practical context. Offers up-to-date coverage of modern battery management technology and practice Provides case studies of real-world engineering applications Guides readers from electric vehicle fundamentals to advanced battery management topics Includes chapter introductions and summaries, case studies, and color charts, graphs, and illustrations Suitable for advanced undergraduate and graduate coursework, Advanced Battery Management Technologies for Electric Vehicles is equally valuable as a reference for professional researchers and engineers.

## Electromechanical Control Technology and Transportation

The book presents interesting topics from the area of modeling and simulation of electric vehicles application. The results presented by the authors of the book chapters are very interesting and inspiring. The book will familiarize the readers with the solutions and enable the readers to enlarge them by their own research. It will be useful for students of Electrical Engineering; it helps them solve practical problems.

## Modeling and Simulation for Electric Vehicle Applications

This SpringerBrief deals with the control and optimization problem in hybrid electric vehicles. Given that there are two (or more) energy sources (i.e., battery and fuel) in hybrid vehicles, it shows the reader how to implement an energy-

management strategy that decides how much of the vehicle's power is provided by each source instant by instant. Hybrid Electric Vehicles: •introduces methods for modeling energy flow in hybrid electric vehicles; •presents a standard mathematical formulation of the optimal control problem; •discusses different optimization and control strategies for energy management, integrating the most recent research results; and •carries out an overall comparison of the different control strategies presented. Chapter by chapter, a case study is thoroughly developed, providing illustrative numerical examples that show the basic principles applied to real-world situations. The brief is intended as a straightforward tool for learning quickly about state-of-the-art energy-management strategies. It is particularly well-suited to the needs of graduate students and engineers already familiar with the basics of hybrid vehicles but who wish to learn more about their control strategies.

## Optimal Flexibility Allocation in Electrical Distribution Grids

Presenting the policy drivers, benefits and challenges for grid integration of electric vehicles (EVs) in the open electricity market environment, this book provides a comprehensive overview of existing electricity markets and demonstrates how EVs are integrated into these different markets and power systems. Unlike other texts, this book analyses EV integration in parallel with electricity market design, showing the interaction between EVs and differing electricity markets. Future regulating power market and distribution system operator (DSO) market design is covered, with up-to-date case studies and examples to help readers carry out similar projects across the world. With in-depth analysis, this book describes: the impact of EV charging and discharging on transmission and distribution networks market-driven EV congestion management techniques, for example the day-ahead tariff based congestion management scenario within electric distribution networks optimal EV charging management with the fleet operator concept and smart charging management EV battery technology, modelling and tests the use of EVs for balancing power fluctuations from renewable energy sources, looking at power system operation support, including frequency reserve, power regulation and voltage support An accessible technical book for power engineers and grid/distributed systems operators, this also serves as a reference text for researchers in the area of EVs and power systems. It provides distribution companies with the knowledge they need when facing the challenges introduced by large scale EV deployment, and demonstrates how transmission system operators (TSOs) can develop the existing system service market in order to fully utilize the potential of EV flexibility. With thorough coverage of the technologies for EV integration, this volume is informative for research professors and graduate students in power systems; it will also appeal to EV manufacturers, regulators, EV market professionals, energy providers and traders, mobility providers, EV charging station companies, and policy makers.

## Technologies and Applications for Smart Charging of Electric and Plug-in Hybrid Vehicles

This authoritative new resource provides a comprehensive introduction to plug-in electric vehicles (PEVs), including critical discussions on energy storage and converter technology. The architecture and models for sustainable charging infrastructures and capacity planning of small scale fast charging stations are presented. This book considers PEVs as mobile storage units and explains how PEVS can provide services to the grid. Enabling technologies are explored, including energy storage, converter, and charger technologies for home and park charging. The adoption of EV is discussed and examples are given from the individual battery level to the city level. This book provides guidance on how to build and design sustainable transportation systems. Optimal arrival rates, optimal service rates, facility location problems, load balancing, and demand forecasts are covered in this book. Time-saving MATLAB code and background tables are included in this resource to help engineers with their projects in the field.

## Vehicle Propulsion Systems

This book is intended for academics and engineers who are working in universities, research institutes, utility and industry sectors wishing to enhance their idea and get new information about the energy efficiency developments in smart grid. The readers will gain special experience with deep information and new idea about the energy efficiency topics. This book includes lots of problems and solutions that can easily be understood and integrated into larger projects and researches. The book enables some studies about monitoring, management and measures related to smart grid components, Energy Efficiency Improvements in smart grid components and new intelligent Control strategies for Distributed energy resources, boosting PV systems, electrical vehicles, etc. It included optimization concepts for power system, promoting value propositions; protection in power system, etc. The book also has some recent developments in solar cell technologies, LEDs and non thermal plasma technology. As I enjoyed preparing this book I am sure that it will be very valuable for large sector of readers.

## Distributed Control Methods and Cyber Security Issues in Microgrids

IPCC Report on sources, capture, transport, and storage of CO2, for researchers, policy-makers and engineers.

## Development and Integration of Microgrids

A theoretical and technical guide to the electric vehicle lithium-ion battery management system Covers the timely topic of battery management systems for lithium batteries. After introducing the problem and basic background theory, it discusses battery modeling and state estimation. In addition to theoretical modeling it also contains practical information on charging and discharging control technology, cell equalisation and application to electric vehicles, and a discussion of the key

technologies and research methods of the lithium-ion power battery management system. The author systematically expounds the theory knowledge included in the lithium-ion battery management systems and its practical application in electric vehicles, describing the theoretical connotation and practical application of the battery management systems. Selected graphics in the book are directly derived from the real vehicle tests. Through comparative analysis of the different system structures and different graphic symbols, related concepts are clear and the understanding of the battery management systems is enhanced. Contents include: key technologies and the difficulty point of vehicle power battery management system; lithium-ion battery performance modeling and simulation; the estimation theory and methods of the lithium-ion battery state of charge, state of energy, state of health and peak power; lithium-ion battery charge and discharge control technology; consistent evaluation and equalization techniques of the battery pack; battery management system design and application in electric vehicles. A theoretical and technical guide to the electric vehicle lithium-ion battery management system Using simulation technology, schematic diagrams and case studies, the basic concepts are described clearly and offer detailed analysis of battery charge and discharge control principles Equips the reader with the understanding and concept of the power battery, providing a clear cognition of the application and management of lithium ion batteries in electric vehicles Arms audiences with lots of case studies Essential reading for Researchers and professionals working in energy technologies, utility planners and system engineers.

## Carbon Dioxide Capture and Storage

This book constitutes the refereed proceedings of the 5th International Conference on Dependability in Sensor, Cloud, and Big Data Systems and Applications, DependSys, held in Guangzhou, China, in November 2019. The volume presents 39 full papers, which were carefully reviewed and selected from 112 submissions. The papers are organized in topical sections on dependability and security fundamentals and technologies; dependable and secure systems; dependable and secure applications; dependability and security measures and assessments; explainable artificial inteligence for cyberspace.

## Grid Integration of Electric Vehicles in Open Electricity Markets

This book highlights the latest advancements in the planning and operation of plug-in electric vehicles (PEV). In-depth, the book presents essential planning and operation techniques to manage the PEV fleet and handle the related uncertainties associated with the drivers' behavior. Several viewpoints are presented in the book, ranging from the local distribution companies to generation companies to the aggregators. Problems such as parking lot allocation and charging management are investigated, taking into consideration the technical, geographical, and social aspects in a smart grid infrastructure.

## Energy Management of Distributed Generation Systems

This book examines recent research on designing online charging and discharging strategies for mobile electric vehicles (EVs) in smart grid. First, the architecture and applications are provided. Then, the authors review the existing works on charging and discharging strategy design for EVs. Critical challenges and research problems are identified. Promising solutions are proposed to accommodate the issues of high EV mobility, vehicle range anxiety, and power systems overload. The authors investigate innovating charging and discharging potentials for mobile EVS based on real-time information collections (via VANETS and/or cellular networks) and offer the power system adjustable load management methods. Several innovative charging/discharging strategy designs to address the challenging issues in smart grid, i.e., overload avoidance and range anxiety for individual EVs, are presented. This book presents an alternative and promising way to release the pressure of the power grid caused by peak-time EV charging demand. Mobile Electric Vehicles: Online Charging and Discharging provides valuable insights on charging/ discharging strategy design for mobile EVs and the power system management in a smart grid. The authors' findings indicate that the proposed strategies considerably outperform the traditional EV charging strategies without real-time collections on the metrics of the overall energy utilizat ion, the average EV travel cost and the number of successfully charged EVs. Research and graduate students who are working on smart grid and vehicular communication will find this book a valuable resource. Customs and systems operators will also find this book useful.

## Fundamentals and Applications of Lithium-ion Batteries in Electric Drive Vehicles

This book constitutes the proceedings of the 16th International Conference on Remote Engineering and Virtual Instrumentation (REV), held at the BMS College of Engineering, Bangalore, India on 3–6 February 2019. Today, online technologies are at the core of most fields of engineering, as well as of society as a whole, and are inseparably connected with Internet of Things, cyber-physical systems, collaborative networks and grids, cyber cloud technologies, service architectures, to name but a few. Since it was first held in, 2004, the REV conference has focused on the increasing use of the Internet for engineering tasks and the problems surrounding it. The 2019 conference demonstrated and discussed the fundamentals, applications and experiences in the field of online engineering and virtual instrumentation. It also presented guidelines for university-level courses on these topics, in view of the increasing globalization of education and the demand for teleworking, remote services and collaborative working environments.

## Cyber-physical Systems and Digital Twins

Master's Thesis from the year 2019 in the subject Energy Sciences, grade: 1.0, Technical University of Munich, language: English, abstract: With the rising adoption of Electric Vehicle (EV) technology and Renewable Energy Sources (RES), electric distribution grids are facing new challenges regarding congestion management. The present work steps into the topic of

controlled charging mechanisms to reduce physical grid extension by utilizing flexible loads from EV. Although, existing research concludes a positive impact on congestion relief, less attention is given to a holistic and light system that is implementable under current circumstances. This thesis develops a novel system towards micro-auctions for local flexibility allocation amongst EVs to reduce grid congestion. A functional software prototype simulates a virtual market and grid environment. Each EV acts as an autonomous agent submitting bids to the local flexibility market, offering 15-minute charging breaks. Based on individual risk preference and state-of-charge, bidprices vary amongst EVs. The Distribution Grid Operator (DSO) constantly asses grid status and contracts positive capacity during critical phases by accepting current bids. It can be shown, that regardless of the penetration rate of EVs, the proposed model balances the tested grid topology below the maximum workload and within a predefined range. According to simulation assumptions, a ninefold increase of EVs can be accommodated with the proposed model. Although, with monotonically increasing penetration rate, average charge-increase converges to zero. Due to the proposed intervals, EVs are grouped to continues batches with demandresponse latency. Once contracted, EVs remain charging or not-charging for 15 minutes. The assignment to certain batches does not change over simulation time. Based on the proposed request control mechanism, critical grid conditions can be reduced by 49%. Whereas quantitative results are limited to the proposed simulation assumptions, qualitative effects are generalizable to a certain extend.

## New Trends in Electrical Vehicle Powertrains

This book focuses on a wide range of optimization, learning, and control algorithms for interdependent complex networks and their role in smart cities operation, smart energy systems, and intelligent transportation networks. It paves the way for researchers working on optimization, learning, and control spread over the fields of computer science, operation research, electrical engineering, civil engineering, and system engineering. This book also covers optimization algorithms for large-scale problems from theoretical foundations to real-world applications, learning-based methods to enable intelligence in smart cities, and control techniques to deal with the optimal and robust operation of complex systems. It further introduces novel algorithms for data analytics in large-scale interdependent complex networks. • Specifies the importance of efficient theoretical optimization and learning methods in dealing with emerging problems in the context of interdependent networks • Provides a comprehensive investigation of advance data analytics and machine learning algorithms for large-scale complex networks • Presents basics and mathematical foundations needed to enable efficient decision making and intelligence in interdependent complex networks M. Hadi Amini is an Assistant Professor at the School of Computing and Information Sciences at Florida International University (FIU). He is also the founding director of Sustainability, Optimization, and Learning for InterDependent networks laboratory (solid lab). He received his Ph.D. and M.Sc. from Carnegie Mellon University in 2019 and 2015 respectively. He also holds a doctoral degree in Computer Science and Technology. Prior to that, he received M.Sc. from Tarbiat Modares University in 2013, and the B.Sc. from Sharif University of Technology in 2011.

## Modeling, Dynamics, and Control of Electrified Vehicles

This Special Edition of Energies on “Energy Storage and Management for Electric Vehicles” draws together a collection of research papers that critically evaluates key areas of innovation and novelty when designing and managing the high-voltage battery system within an electrified powertrain. The addressed topics include design optimisation, mathematical modelling, control engineering, thermal management, and component sizing.

## Control and Optimization Methods for Electric Smart Grids

This book outlines issues related to massive integration of electric and plug-in hybrid electric vehicles into power grids. Electricity is becoming the preferred energy vector for the next new generation of road vehicles. It is widely acknowledged that road vehicles based on full electric or hybrid drives can mitigate problems related to fossil fuel dependence. This book explains the emerging and understanding of storage systems for electric and plug-in hybrid vehicles. The recharging stations for these types of vehicles might represent a great advantage for the electric grid by facilitating integration of renewable and distributed energy production. This book presents a broad review from analyzing current literature to on-going research projects about the new power technologies related to the various charging architectures for electric and plug-in hybrid vehicles. Specifically focusing on DC fast charging operations, as well as, grid-connected power converters and the full range of energy storage systems. These key components are analyzed for distributed generation and charging system integration into micro-grids. The authors demonstrate that these storage systems represent effective interfaces for the control and management of renewable and sustainable distributed energy resources. New standards and applications are emerging from micro-grid pilot projects around the world and case studies demonstrate the convenience and feasibility of distributed energy management. The material in this unique volume discusses potential avenues for further research toward achieving more reliable, more secure and cleaner energy.

## Battery Management Algorithm for Electric Vehicles

This book discusses the technical, economic, and environmental aspects of electric vehicles and their impact on electrical grids and energy systems. The book is divided into three parts that include load modeling, integration and optimization, and environmental evaluation. Theoretical background and practical examples accompany each section and the authors include helpful tips and hints in the load modeling and optimization sections. This book is intended to be a useful tool for undergraduate and graduate students, researchers and engineers who are trying to solve power and engineering problems related electric vehicles. Provides optimization techniques and their applications for energy systems; Discusses the economic and environmental perspectives of electric vehicles; Contains the most comprehensive information about electric

vehicles in a single source.

## Grid Optimal Integration of Electric Vehicles: Examples with Matlab Implementation

This book constitutes the refereed proceedings of the 4th IFIP WG 5.5/SOCOLNET Doctoral Conference on Computing, Electrical and Industrial Systems, DoCEIS 2013, held in Costa de Caparica, Portugal, in April 2013. The 69 revised full papers were carefully reviewed and selected from numerous submissions. They cover a wide spectrum of topics ranging from collaborative enterprise networks to microelectronics. The papers are organized in the following topical sections: collaborative enterprise networks; service orientation; intelligent computational systems; computational systems; computational systems applications; perceptional systems; robotics and manufacturing; embedded systems and Petri nets; control and decision; integration of power electronics systems with ICT; energy generation; energy distribution; energy transformation; optimization techniques in energy; telecommunications; electronics: devices design; electronics: amplifiers; electronics: RF applications; and electronics: applications.

## 2020 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT)

This is an engineering reference book on hybrid vehiclesystem analysis and design, an outgrowth of theauthor's substantial work in research, development andproduction at the National Research Council Canada, Azure Dynamicsand now General Motors. It is an irreplaceable tool for helpingengineers develop algorithms and gain a thorough understanding ofhybrid vehicle systems. This book covers all the major aspects ofhybrid vehicle modeling, control, simulation, performance analysisand preliminary design. It not only systemically provides the basicknowledge of hybrid vehicle system configuration and maincomponents, but also details their characteristics and mathematicmodels. Provides valuable technical expertise necessary forbuilding hybrid vehicle system and analyzing performance viadrivability, fuel economy and emissions Built from the author's industry experience at major vehiclecompanies including General Motors and Azure Dynamics Inc. Offers algorithm implementations and figures/examplesextracted from actual practice systems Suitable for a training course on hybrid vehicle systemdevelopment with supplemental materials An essential resource enabling hybrid development and designengineers to understand the hybrid vehicle systems necessary forcontrol algorithm design and developments.

## Plug-in Electric Vehicle Grid Integration

The EEM conference has gained a strong reputation in both European and international levels for providing an excellent ground for experts to discuss a wide range of issues regarding the energy markets Following the past successful EEM conferences, we have an exciting program at our conference that will allow students, professors and industry experts to

reflect on and discuss many aspects of the current energy markets worldwide

## Hybrid Electric Vehicles

In this book, leading experts in power, control and communication systems discuss the most promising recent research in smart grid modeling, control and optimization. The book goes on to the foundation for future advances in this critical field of study.

## 2020 17th International Conference on the European Energy Market (EEM)

The electric vehicle and plug-in hybrid electric vehicle play a fundamental role in the forthcoming new paradigms of mobility and energy models. The electrification of the transport sector would lead to advantages in terms of energy efficiency and reduction of greenhouse gas emissions, but would also be a great opportunity for the introduction of renewable sources in the electricity sector. The chapters in this book show a diversity of current and new developments in the electrification of the transport sector seen from the electric vehicle point of view: first, the related technologies with design, control and supervision, second, the powertrain electric motor efficiency and reliability and, third, the deployment issues regarding renewable sources integration and charging facilities. This is precisely the purpose of this book, that is, to contribute to the literature about current research and development activities related to new trends in electric vehicle power trains.

## Energy Efficiency Improvements in Smart Grid Components

Modelling, Dynamics and Control of Electrified Vehicles provides a systematic overview of EV-related key components, including batteries, electric motors, ultracapacitors and system-level approaches, such as energy management systems, multi-source energy optimization, transmission design and control, braking system control and vehicle dynamics control. In addition, the book covers selected advanced topics, including Smart Grid and connected vehicles. This book shows how EV work, how to design them, how to save energy with them, and how to maintain their safety. The book aims to be an all-in-one reference for readers who are interested in EVs, or those trying to understand its state-of-the-art technologies and future trends. Offers a comprehensive knowledge of the multidisciplinary research related to EVs and a system-level understanding of technologies Provides the state-of-the-art technologies and future trends Covers the fundamentals of EVs and their methodologies Written by successful researchers that show the deep understanding of EVs

## Intelligent Control of Connected Plug-in Hybrid Electric Vehicles

This book systematically introduces readers to the core algorithms of battery management system (BMS) for electric vehicles. These algorithms cover most of the technical bottlenecks encountered in BMS applications, including battery system modeling, state of charge (SOC) and state of health (SOH) estimation, state of power (SOP) estimation, remaining useful life (RUL) prediction, heating at low temperature, and optimization of charging. The book not only presents these algorithms, but also discusses their background, as well as related experimental and hardware developments. The concise figures and program codes provided make the calculation process easy to follow and apply, while the results obtained are presented in a comparative way, allowing readers to intuitively grasp the characteristics of different algorithms. Given its scope, the book is intended for researchers, senior undergraduate and graduate students, as well as engineers in the fields of electric vehicles and energy storage.

## Plug In Electric Vehicles in Smart Grids

The utilization of AC or DC microgrids across the world has increased dramatically over the years and has led to development opportunities as well as technical challenges when they are connected to the main grids or used as stand-alone systems. This book overviews the development of AC/DC microgrids; explains the microgrid concepts, design and control considerations, discusses operational and technical issues, as well as interconnection and integration of these systems. This book is served as a reference for a general audience of researchers, academics, PhD students and practitioners in the field of power engineering.

## Overcoming Barriers to Deployment of Plug-in Electric Vehicles

The authors of this text have written a comprehensive introduction to the modeling and optimization problems encountered when designing new propulsion systems for passenger cars. It is intended for persons interested in the analysis and optimization of vehicle propulsion systems. Its focus is on the control-oriented mathematical description of the physical processes and on the model-based optimization of the system structure and of the supervisory control algorithms.

## Optimal Charging Control of Electric Vehicles in Smart Grids

The 2017 2nd International Conference on Electromechanical Control Technology and Transportation (ICECTT 2017) was held on January 14–15, 2017 in Zhuhai, China. ICECTT 2017 brought together academics and industrial experts in the field of electromechanical control technology and transportation to a common forum. The primary goal of the conference was to promote research and developmental activities in electromechanical control technology and transportation. Another goal was to promote exchange of scientific information between researchers, developers, engineers, students, and practitioners

working all around the world. The conference will be held every year thus making it an ideal platform for people to share views and experiences in electromechanical control technology and transportation and related areas.

## Dependability in Sensor, Cloud, and Big Data Systems and Applications

This book is a compilation of recent research on distributed optimization algorithms for the integral load management of plug-in electric vehicle (PEV) fleets and their potential services to the electricity system. It also includes detailed developed Matlab scripts. These algorithms can be implemented and extended to diverse applications where energy management is required (smart buildings, railways systems, task sharing in micro-grids, etc.). The proposed methodologies optimally manage PEV fleets' charge and discharge schedules by applying classical optimization, game theory, and evolutionary game theory techniques. Taking owner's requirements into consideration, these approaches provide services like load shifting, load balancing among phases of the system, reactive power supply, and task sharing among PEVs. The book is intended for use in graduate optimization and energy management courses, and readers are encouraged to test and adapt the scripts to their specific applications.

## Mobile Electric Vehicles

What are smart cities? What are their purposes? What are the impacts resulting from their implementations? With these questions in mind, this book is compiled with the primary concern of answering readers with different profiles; from those interested in acquiring basic knowledge about the various topics surrounding the subject related to smart cities, to those who are more motivated by knowing the technical elements and the technological apparatus involving this theme. This book audience is multidisciplinary, as it will be confirmed by the various chapters addressed here. It explores different knowledge areas, such as electric power systems, signal processing, telecommunications, electronics, systems optimization, computational intelligence, real-time systems, renewable energy systems, and information systems.

## Technological Innovation for the Internet of Things

## Advanced Computational Methods in Energy, Power, Electric Vehicles, and Their Integration

The three-volume set CCIS 761, CCIS 762, and CCIS 763 constitutes the thoroughly refereed proceedings of the International Conference on Life System Modeling and Simulation, LSMS 2017, and of the International Conference on Intelligent Computing for Sustainable Energy and Environment, ICSEE 2017, held in Nanjing, China, in September 2017. The

208 revised full papers presented were carefully reviewed and selected from over 625 submissions. The papers of this volume are organized in topical sections on: Biomedical Signal Processing; Computational Methods in Organism Modeling; Medical Apparatus and Clinical Applications; Bionics Control Methods, Algorithms and Apparatus; Modeling and Simulation of Life Systems; Data Driven Analysis; Image and Video Processing; Advanced Fuzzy and Neural Network Theory and Algorithms; Advanced Evolutionary Methods and Applications; Advanced Machine Learning Methods and Applications; Intelligent Modeling, Monitoring, and Control of Complex Nonlinear Systems; Advanced Methods for Networked Systems; Control and Analysis of Transportation Systems; Advanced Sliding Mode Control and Applications; Advanced Analysis of New Materials and Devices; Computational Intelligence in Utilization of Clean and Renewable Energy Resources; Intelligent Methods for Energy Saving and Pollution Reduction; Intelligent Methods in Developing Electric Vehicles, Engines and Equipment; Intelligent Computing and Control in Power Systems; Modeling, Simulation and Control in Smart Grid and Microgrid; Optimization Methods; Computational Methods for Sustainable Environment.

## Energy Storage and Management for Electric Vehicles

This book focuses on the design of decentralized optimization methods applied to charging strategies for large-scale PEVs in electrical power systems. It studies several classes of charging coordination problems in large-scale PEVs by considering the distinct characteristics of PEV populations and electrical power systems, and subsequently designs decentralized methods based on distinct optimization schemes – such as non-cooperative games, mean-field games, and auction games – to achieve optimal/nearly optimal charging strategies. In closing, several performance aspects of the proposed algorithms, such as their convergence, computational complexity and optimality etc., are rigorously verified and demonstrated in numerical simulations. Given its scope, the book will benefit researchers, engineers, and graduate students in the fields of optimization, game theory, auction games, electrical power systems, etc., and help them design decentralized methods to implement optimal charging strategies in large-scale PEVs.

## Decentralized Charging Coordination of Large-scale Plug-in Electric Vehicles in Power Systems

This book introduces the optimal online charging control of electric vehicles (EVs) and battery energy storage systems (BESSs) in smart grids. The ultimate goal is to minimize the total energy cost as well as reduce the fluctuation of the total power flow caused by the integration of the EVs and renewable energy generators. Using both theoretic analysis and data-driven numerical results, the authors reveal the effectiveness and efficiency of the proposed control techniques. A major benefit of these control techniques is their practicality, since they do not rely on any non-causal knowledge of future information. Researchers, operators of power grids, and EV users will find this to be an exceptional resource. It is also suitable for advanced-level students of computer science interested in networks, electric vehicles, and energy systems.

## Electric Vehicles in Energy Systems

This new edition includes approximately 30% new materials covering the following information that has been added to this important work: extends the contents on Li-ion batteries detailing the positive and negative electrodes and characteristics and other components including binder, electrolyte, separator and foils, and the structure of Li-ion battery cell. Nickel-cadmium batteries are deleted. adds a new section presenting the modelling of multi-mode electrically variable transmission, which gradually became the main structure of the hybrid power-train during the last 5 years. newly added chapter on noise and vibration of hybrid vehicles introduces the basics of vibration and noise issues associated with power-train, driveline and vehicle vibrations, and addresses control solutions to reduce the noise and vibration levels. Chapter 10 (chapter 9 of the first edition) is extended by presenting EPA and UN newly required test drive schedules and test procedures for hybrid electric mileage calculation for window sticker considerations. In addition to the above major changes in this second edition, adaptive charging sustaining point determination method is presented to have a plug-in hybrid electric vehicle with optimum performance.

## Optimization, Learning, and Control for Interdependent Complex Networks

This book covers the recent research advancements in the area of charging strategies that can be employed to accommodate the anticipated high deployment of Plug-in Electric Vehicles (PEVs) in smart grids. Recent literature has focused on various potential issues of uncoordinated charging of PEVs and methods of overcoming such challenges. After an introduction to charging coordination paradigms of PEVs, this book will present various ways the coordinated control can be accomplished. These innovative approaches include hierarchical coordinated control, model predictive control, optimal control strategies to minimize load variance, smart PEV load management based on load forecasting, integrating renewable energy sources such as photovoltaic arrays to supplement grid power, using wireless communication networks to coordinate the charging load of a smart grid and using market price of electricity and customers payment to coordinate the charging load. Hence, this book proposes many new strategies proposed recently by the researchers around the world to address the issues related to coordination of charging load of PEVs in a future smart grid.