

Pulse Width Modulation For Power Converters Principles And Practice

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Control of Induction Motors - Andrzej Trzynadlowski 2001

This is a reference source for practising engineers specializing in electric power engineering and industrial electronics. It begins with the basic dynamic models of induction motors and progresses to low- and high-performance drive systems.

Digital Control of High-Frequency Switched-Mode Power Converters - Luca Corradini 2015-07-10

Advanced Multilevel Converters and Applications in Grid Integration - Ali Iftekhar Maswood 2019-01-04

A comprehensive survey of advanced multilevel converter design, control, operation and grid-connected applications *Advanced Multilevel Converters and Applications in Grid Integration* presents a comprehensive review of the core principles of advanced multilevel converters, which require fewer components and provide higher power conversion efficiency and output power quality. The authors – noted experts in the field – explain in detail the operation principles and control strategies and present the mathematical expressions and design procedures of their components. The text examines the advantages and disadvantages compared to the classical multilevel and two level power converters. The authors also include examples of the industrial applications of the advanced multilevel converters and offer thoughtful explanations on their control strategies. *Advanced Multilevel Converters and Applications in Grid Integration* provides a clear understanding of the gap difference between research conducted and the current industrial needs. This important guide: Puts the focus on the new challenges and topics in related areas such as modulation methods, harmonic analysis, voltage balancing and balanced current injection Makes a strong link between the fundamental concepts of power converters and advances multilevel converter topologies and examines their control strategies, together with practical engineering considerations Provides a valid reference for further developments in the multilevel converters design issue Contains simulations files for further study Written for university students in electrical engineering, researchers in areas of multilevel converters, high-power converters and engineers and operators in power industry, *Advanced Multilevel Converters and Applications in Grid Integration* offers a comprehensive review of the core principles of advanced multilevel converters, with contributions from noted experts in the field.

Pulse Width Modulation for Power Converters - D. Grahame Holmes 2003-10-03

* The first single volume resource for researchers in the field who previously had to depend on separate papers and conference records to attain a working knowledge

of the subject. * Brings together the field's diverse approaches into an integrated and comprehensive theory of PWM

Pulse Width Modulation for Power Converters - D. Grahame Holmes 2003-10-03

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Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications - Haitham Abu-Rub 2014-06-02

Compiles current research into the analysis and design of power electronic converters for industrial applications and renewable energy systems, presenting modern and future applications of power electronics systems in the field of electrical vehicles With emphasis on the importance and long-term viability of Power Electronics for Renewable Energy this book brings together the state of the art knowledge and cutting-edge techniques in various stages of research. The topics included are not currently available for practicing professionals and aim to enable the reader to directly apply the knowledge gained to their designs. The book addresses the practical issues of current and future electric and plug-in hybrid electric vehicles (PHEVs), and focuses primarily on power electronics and motor drives based solutions for electric vehicle (EV) technologies. Propulsion system requirements and motor sizing for EVs is discussed, along with practical system sizing examples. Key EV battery technologies are explained as well as corresponding battery management issues. PHEV power system architectures and advanced power electronics intensive charging infrastructures for EVs and PHEVs are detailed. EV/PHEV interface with renewable energy is described, with practical examples. This book explores new topics for further research needed world-wide, and defines existing challenges, concerns, and selected problems that comply with international trends, standards, and programs for electric power conversion, distribution, and sustainable energy development. It will lead to the advancement of the current state-of-the art applications of power electronics for renewable energy, transportation, and industrial applications and will help add experience in the various industries and academia about the energy conversion technology and distributed energy sources. Combines state of the art global expertise to present the latest research on power electronics and its application in transportation, renewable energy and different industrial applications Offers an overview of existing technology and future trends, with discussion and analysis of different types of converters and control techniques (power converters, high

performance power devices, power system, high performance control system and novel applications) Systematic explanation to provide researchers with enough background and understanding to go deeper in the topics covered in the book **Pulse Width Modulation for Power Converters** - D. Grahame Holmes 2003

Predictive Control of Power Converters and Electrical Drives - Jose Rodriguez 2012-04-30

Describes the general principles and current research into Model Predictive Control (MPC); the most up-to-date control method for power converters and drives. The book starts with an introduction to the subject before the first chapter on classical control methods for power converters and drives. This covers classical converter control methods and classical electrical drives control methods. The next chapter on Model predictive control first looks at predictive control methods for power converters and drives and presents the basic principles of MPC. It then looks at MPC for power electronics and drives. The third chapter is on predictive control applied to power converters. It discusses: control of a three-phase inverter; control of a neutral point clamped inverter; control of an active front end rectifier, and; control of a matrix converter. In the middle of the book there is Chapter four - Predictive control applied to motor drives. This section analyses predictive torque control of industrial machines and predictive control of permanent magnet synchronous motors. Design and implementation issues of model predictive control is the subject of the final chapter. The following topics are described in detail: cost function selection; weighting factors design; delay compensation; effect of model errors, and prediction of future references. While there are hundreds of books teaching control of electrical energy using pulse width modulation, this will be the very first book published in this new topic. Unique in presenting a completely new theoretic solution to control electric power in a simple way. Discusses the application of predictive control in motor drives, with several examples and case studies. Matlab is included on a complementary website so the reader can run their own simulations.

Pulse Width Modulation In Power Electronics - Isaak D Mayergoyz 2021-05-05
This book provides a theoretical discussion of pulse width modulation (PWM) in power electronic inverters. Pulse width modulation is widely used for the frequency control of speed of ac motors, the design of uninterruptible power supplies (UPS) as well as the integration of renewable energy sources into existing power grid systems. PWM technique is based on approximation of sinusoidal waveforms by sequences (trains) of rectangular pulses whose widths are properly modulated. This width-modulation results in the suppression of low order harmonics at the expense of amplification of high order harmonics which are suppressed by energy-storage elements in load circuits. The discussion covers various PWM techniques with a focus on the optimal time-domain PWM techniques proposed by the authors.

Introduction to Microcontroller Programming for Power Electronics Control Applications - Mattia Rossi 2021-09-29

Microcontroller programming is not a trivial task. Indeed, it is necessary to set correctly the required peripherals by using programming languages like C/C++ or directly machine code. Nevertheless, MathWorks® developed a model-based workflow linked with an automatic code generation tool able to translate Simulink® schemes into executable files. This represents a rapid prototyping procedure, and it can be applied to many microcontroller boards available on the market. Among them, this introductory book focuses on the C2000 LaunchPad™ family from Texas

Instruments™ to provide the reader basic programming strategies, implementation guidelines and hardware considerations for some power electronics-based control applications. Starting from simple examples such as turning on/off on-board LEDs, Analog-to-Digital conversion, waveform generation, or how a Pulse-Width-Modulation peripheral should be managed, the reader is guided through the settings of the specific MCU-related Simulink® blocks enabled for code translation. Then, the book proposes several control problems in terms of power management of RL and RLC loads (e.g., involving DC-DC converters) and closed-loop control of DC motors. The control schemes are investigated as well as the working principles of power converter topologies needed to drive the systems under investigation. Finally, a couple of exercises are proposed to check the reader's understanding while presenting a processor-in-the loop (PIL) technique to either emulate the dynamics of complex systems or testing computational performance. Thus, this book is oriented to graduate students of electrical and automation and control engineering pursuing a curriculum in power electronics and drives, as well as to engineers and researchers who want to deepen their knowledge and acquire new competences in the design and implementations of control schemes aimed to the aforementioned application fields. Indeed, it is assumed that the reader is well acquainted with fundamentals of electrical machines and power electronics, as well as with continuous-time modeling strategies and linear control techniques. In addition, familiarity with sampled-data, discrete-time system analysis and embedded design topics is a plus. However, even if these competences are helpful, they are not essential, since this book provides some basic knowledge even to whom is approaching these topics for the first time. Key concepts are developed from scratch, including a brief review of control theory and modeling strategies for power electronic-based systems.

Integration of Green and Renewable Energy in Electric Power Systems - Ali Keyhani 2009-11-20

A practical, application-oriented text that presents analytical results for the better modeling and control of power converters in the integration of green energy in electric power systems. The combined technology of power semiconductor switching devices, pulse width modulation algorithms, and control theories are being further developed along with the performance improvement of power semiconductors and microprocessors so that more efficient, reliable, and cheaper electric energy conversion can be achieved within the next decade. Integration of Green and Renewable Energy in Electric Power Systems covers the principles, analysis, and synthesis of closed loop control of pulse width modulated converters in power electronics systems, with special application emphasis on distributed generation systems and uninterruptible power supplies. The authors present two versions of a documented simulation test bed for homework problems and projects based on Matlab/Simulink, designed to help readers understand the content through simulations. The first consists of a number of problems and projects for classroom teaching convenience and learning. The second is based on the most recent work in control of power converters for the research of practicing engineers and industry researchers. Addresses a combination of the latest developments in control technology of pulse width modulation algorithms and digital control methods. Problems and projects have detailed mathematical modeling, control design, solution steps, and results. Uses a significant number of tables, circuit and block diagrams, and waveform plots with well-designed, class-tested problems/solutions and projects designed for the best teaching-learning interaction. Provides computer simulation programs as examples for ease of understanding and platforms for the

projects Covering major power-conversion applications that help professionals from a variety of industries, *Integration of Green and Renewable Energy in Electric Power Systems* provides practical, application-oriented system analysis and synthesis that is instructional and inspiring for practicing electrical engineers and researchers as well as undergraduate and graduate students.

Recent Developments on Power Inverters - Ali Saghafinia 2017-06-21

This book develops some methods and structures to improve the power inverters for different applications in a single-phase or three-phase output in recent years. The reduction of the switching devices and multilevel inverters as changing structure for the power inverters and PDM and PWM methods as changing control methods for the power inverter are studied in this book. Moreover, power inverters are developed to supply open-ended loads. Furthermore, the basic and advanced aspects of the electric drives that are control based are taught for induction motor (IM) based on power inverters suitable for both undergraduate and postgraduate levels. The main objective of this book is to provide the necessary background to improve and implement the high-performance inverters. Once the material in this book has been mastered, the reader will be able to apply these improvements in the power inverters to his or her problems for high-performance power inverters.

Advanced Power Electronics Converters - Euzeli dos Santos 2014-11-10

This book covers power electronics, in depth, by presenting the basic principles and application details, which can be used both as a textbook and reference book. Introduces a new method to present power electronics converters called Power Blocks Geometry (PBG) Applicable for courses focusing on power electronics, power electronics converters, and advanced power converters Offers a comprehensive set of simulation results to help understand the circuits presented throughout the book

Dynamics and Control of Switched Electronic Systems - Francesco Vasca 2012-03-28

The increased efficiency and quality constraints imposed on electrical energy systems have inspired a renewed research interest in the study of formal approaches to the analysis and control of power electronics converters. Switched systems represent a useful framework for modeling these converters and the peculiarities of their operating conditions and control goals justify the specific classification of "switched electronic systems". Indeed, idealized switched models of power converters introduce problems not commonly encountered when analyzing generic switched models or non-switched electrical networks. In that sense the analysis of switched electronic systems represents a source for new ideas and benchmarks for switched and hybrid systems generally. *Dynamics and Control of Switched Electronic Systems* draws on the expertise of an international group of expert contributors to give an overview of recent advances in the modeling, simulation and control of switched electronic systems. The reader is provided with a well-organized source of references and a mathematically-based report of the state of the art in analysis and design techniques for switched power converters. Intuitive language, realistic illustrative examples and numerical simulations help the reader to come to grips with the rigorous presentation of many promising directions of research such as: converter topologies and modulation techniques; continuous-time, discrete-time and hybrid models; modern control strategies for power converters; and challenges in numerical simulation. The guidance and information imparted in this text will be appreciated by engineers, and applied mathematicians working on system and circuit theory, control systems development, and electronic and energy conversion systems design.

Handbook of Fractional-Horsepower Drives - Hans-Dieter Stoelting 2008-04-29

Aimed at engineers in product development as well as advanced students of electrical engineering, control and mechatronics, this is the first English-language edition of the bestselling German book in which the authors address the issue of fractional horsepower drives. They are crucial for all kinds of products, from simple domestic utensils to the most complex and advanced technological applications. This handbook gives a practical overview on all of the available drives.

Soft Commutation Isolated DC-DC Converters - Ivo Barbi 2018-08-27

This book describes the operation and analysis of soft-commutated isolated DC-DC converters used in the design of high efficiency and high power density equipment. It explains the basic principles behind first- and second-order circuits with power switches to enable readers to understand the importance of these converters in high efficiency and high power density power supply design for residential, commercial, industrial and medical use as well as in aerospace equipment. With each chapter featuring a different power converter topology, the book covers the most important resonant converters, including series resonant converters; resonant LLC converters; soft commutation pulse width modulation converters; zero voltage switching; and zero current switching. Each topic is presented with full analysis, a showcase of the power stages of the converters, exercises and their solutions as well as simulation results, which mainly focus on the commutation analysis and output characteristic. This book is a valuable source of information for professionals working in power electronics, power conversion and design of high efficiency and high power density DC-DC converters and switch mode power supplies. The book also serves as a point of reference for engineers responsible for development projects and equipment in companies and research centers and a text for advanced students.

Pulse-Width Modulated DC-DC Power Converters - Marian K. Kazimierczuk 2015-08-24

PWM DC-DC power converter technology underpins many energy conversion systems including renewable energy circuits, active power factor correctors, battery chargers, portable devices and LED drivers. Following the success of *Pulse-Width Modulated DC-DC Power Converters* this second edition has been thoroughly revised and expanded to cover the latest challenges and advances in the field. Key features of 2nd edition: Four new chapters, detailing the latest advances in power conversion, focus on: small-signal model and dynamic characteristics of the buck converter in continuous conduction mode; voltage-mode control of buck converter; small-signal model and characteristics of the boost converter in the discontinuous conduction mode and electromagnetic compatibility EMC. Provides readers with a solid understanding of the principles of operation, synthesis, analysis and design of PWM power converters and semiconductor power devices, including wide band-gap power devices (SiC and GaN). Fully revised Solutions for all end-of-chapter problems available to instructors via the book companion website. Step-by-step derivation of closed-form design equations with illustrations. Fully revised figures based on real data. With improved end-of-chapter summaries of key concepts, review questions, problems and answers, biographies and case studies, this is an essential textbook for graduate and senior undergraduate students in electrical engineering. Its superior readability and clarity of explanations also makes it a key reference for practicing engineers and research scientists.

PID and Predictive Control of Electrical Drives and Power Converters using MATLAB / Simulink - Liuping Wang 2015-03-02

A timely introduction to current research on PID and predictive control by one of

the leading authors on the subject PID and Predictive Control of Electric Drives and Power Supplies using MATLAB/Simulink examines the classical control system strategies, such as PID control, feed-forward control and cascade control, which are widely used in current practice. The authors share their experiences in actual design and implementation of the control systems on laboratory test-beds, taking the reader from the fundamentals through to more sophisticated design and analysis. The book contains sections on closed-loop performance analysis in both frequency domain and time domain, presented to help the designer in selection of controller parameters and validation of the control system. Continuous-time model predictive control systems are designed for the drives and power supplies, and operational constraints are imposed in the design. Discrete-time model predictive control systems are designed based on the discretization of the physical models, which will appeal to readers who are more familiar with sampled-data control system. Soft sensors and observers will be discussed for low cost implementation. Resonant control of the electric drives and power supply will be discussed to deal with the problems of bias in sensors and unbalanced three phase AC currents. Brings together both classical control systems and predictive control systems in a logical style from introductory through to advanced levels Demonstrates how simulation and experimental results are used to support theoretical analysis and the proposed design algorithms MATLAB and Simulink tutorials are given in each chapter to show the readers how to take the theory to applications. Includes MATLAB and Simulink software using xPC Target for teaching purposes A companion website is available Researchers and industrial engineers; and graduate students on electrical engineering courses will find this a valuable resource.

Digital Control in Power Electronics - Simone Buso 2015-05-01

This book presents the reader, whether an electrical engineering student in power electronics or a design engineer, a selection of power converter control problems and their basic digital solutions, based on the most widespread digital control techniques. The presentation is primarily focused on different applications of the same power converter topology, the half-bridge voltage source inverter, considered both in its single- and three-phase implementation. This is chosen as the test case because, besides being simple and well known, it allows the discussion of a significant spectrum of the most frequently encountered digital control applications in power electronics, from digital pulse width modulation (DPWM) and space vector modulation (SVM), to inverter output current and voltage control, ending with the relatively more complex VSI applications related to the so called smart-grid scenario. This book aims to serve two purposes: (1) to give a basic, introductory knowledge of the digital control techniques applied to power converters; and (2) to raise the interest for discrete time control theory, stimulating new developments in its application to switching power converters.

Advanced Pulse-Width-Modulation: With Freedom to Optimize Power Electronics Converters - Dong Jiang 2021-01-20

This book is a technical publication for students, scholars and engineers in electrical engineering, focusing on the pulse-width-modulation (PWM) technologies in power electronics area. Based on an introduction of basic PWM principles this book analyzes three major challenges for PWM on system performance: power losses, voltage/current ripple and electromagnetic interference (EMI) noise, and the lack of utilization of control freedoms in conventional PWM technologies. Then, the model of PWM's impact on system performance is introduced, with the current ripple prediction method for voltage source converter as example. With the prediction model, two major advanced PWM methods are introduced: variable switching frequency

PWM and phase-shift PWM, which can reduce the power losses and EMI for the system based on the prediction model. Furthermore, the advanced PWM can be applied in advanced topologies including multilevel converters and paralleled converters. With more control variables in the advanced topologies, performance of PWM can be further improved. Also, for the special problem for common-mode noise, this book introduces modified PWM method for reduction. Especially, the paralleled inverters with advanced PWM can achieve good performance for the common-mode noise reduction. Finally, the implementation of PWM technologies in hardware is introduced in the last part.

Pulse-width Modulated DC-DC Power Converters - Marian K. Kazimierczuk 2014-03-31
Fully worked solutions with clear explanations The Pulse-width Modulated DC-DC Power Converters: Solutions Manual provides solutions to the practice problems in the text. Fully worked, each solution includes formulas and diagrams as necessary to help you understand the approach, and explanations clarify the reasoning behind the correct answer. The solutions are aligned chapter-by-chapter with the text, and provide useful guidance that can help you identify your level of comprehension. Designed to make your study time more productive, this solutions manual is an invaluable tool for anyone studying electricity and electrical engineering.

High-Power Converters and AC Drives - Bin Wu 2007-01-29

This book presents the latest cutting-edge technology in high-power converters and medium voltage drives, and provides a complete analysis of various converter topologies, modulation techniques, practical drive configurations, and advanced control schemes. Supplemented with more than 250 illustrations, the author illustrates key concepts with simulations and experiments. Practical problems, along with accompanying solutions, are presented to help you tackle real-world issues.

Control in Power Electronics - Marian P. Kazmierkowski 2002-08-30

The authors were originally brought together to share research and applications through the international Danfoss Professor Programme at Aalborg University in Denmark. Personal computers would be unwieldy and inefficient without power electronic dc supplies. Portable communication devices and computers would also be impractical. High-performance lighting systems, motor controls, and a wide range of industrial controls depend on power electronics. In the near future we can expect strong growth in automotive applications, dc power supplies for communication systems, portable applications, and high-end converters. We are approaching a time when all electrical energy will be processed and controlled through power electronics somewhere in the path from generation to end use. The most up-to-date information available is presented in the text Written by a world renowned leader in the field

Sliding Mode Control of Switching Power Converters - Siew-Chong Tan 2017-10-12

This reference provides a through analysis of sliding mode control principles, their application to power converters, and the practical realization of such controllers. Bridging the gap between power electronics and control theory, it presents a detailed description of the various theories, operating principles, and information relevant to the state of the art and the current development of sliding mode controllers and their applications to power converters. The book also reviews traditional and modern implementation techniques of sliding mode control for power converters--covering pulse-width modulation as well as conventional hysteresis modulation.

Power-Switching Converters - Dorin O. Neacsu 2006-05-25

Power converters are at the heart of modern power electronics. From automotive power systems to propulsion for large ships, their use permeates through industrial, commercial, military, and aerospace applications of various scales. Having reached a point of saturation where we are unlikely to see many new and revolutionary technologies, industry now seeks to optimize and standardize the performance of these devices. *Power-Switching Converters: Medium and High Power* examines the characteristics and operating principles of these systems in terms of how to increase their efficiency and produce them at lower cost. This book begins with an introduction to the field, placing the technology in its business context to highlight the current trends and issues facing the modern power engineer. The remainder of the book provides a detailed examination of three-phase power switching converters, including the various problems and solutions involved in different applications. It discusses high-power semiconductor devices, pulse-width modulation (PWM) principles and algorithms for various implementations, closed-loop current control, component-minimized topologies, power grid interface, parallel and interleaved power converters, and practical aspects such as protection and thermal management. Filling the gap between textbooks and technical papers, *Power-Switching Converters: Medium and High Power* offers practical solutions to current industrial demands with a focus on the particular business needs of performance quality and cost efficiency. It also serves as an excellent textbook for graduate study.

Power Electronics and Motor Drive Systems - Stefanos Manias 2016-11-08

Power Electronics and Motor Drive Systems is designed to aid electrical engineers, researchers, and students to analyze and address common problems in state-of-the-art power electronics technologies. Author Stefanos Manias supplies a detailed discussion of the theory of power electronics circuits and electronic power conversion technology systems, with common problems and methods of analysis to critically evaluate results. These theories are reinforced by simulation examples using well-known and widely available software programs, including SPICE, PSIM, and MATLAB/SIMULINK. Manias expertly analyzes power electronic circuits with basic power semiconductor devices, as well as the new power electronic converters. He also clearly and comprehensively provides an analysis of modulation and output voltage, current control techniques, passive and active filtering, and the characteristics and gating circuits of different power semiconductor switches, such as BJTs, IGBTs, MOSFETs, IGCTs, MCTs and GTOs. Includes step-by-step analysis of power electronic systems Reinforced by simulation examples using SPICE, PSIM, and MATLAB/SIMULINK Provides 110 common problems and solutions in power electronics technologies

Pulse Width Modulation for Power Converters - D. Grahame Holmes 2003-10-03

Table of contents

Soft-Switching PWM Full-Bridge Converters - Xinbo Ruan 2014-04-03

Soft-switching PWM full-bridge converters have been widely used in medium-to-high power dc-dc conversions for topological simplicity, easy control and high efficiency. Early works on soft-switching PWM full-bridge converter by many researchers included various topologies and modulation strategies. However, these works were scattered, and the relationship among these topologies and modulation strategies had not been revealed. This book intends to describe systematically the soft-switching techniques for pulse-width modulation (PWM) full-bridge converters, including the topologies, control and design, and it reveals the relationship among the various topologies and PWM strategies previously proposed by other researchers. The book not only presents theoretical analysis, but also

gives many detailed design examples of the converters.

Voltage-Sourced Converters in Power Systems - Amirnaser Yazdani 2010-03-25
Presents Fundamentals of Modeling, Analysis, and Control of Electric Power Converters for Power System Applications Electronic (static) power conversion has gained widespread acceptance in power systems applications; electronic power converters are increasingly employed for power conversion and conditioning, compensation, and active filtering. This book presents the fundamentals for analysis and control of a specific class of high-power electronic converters—the three-phase voltage-sourced converter (VSC). *Voltage-Sourced Converters in Power Systems* provides a necessary and unprecedented link between the principles of operation and the applications of voltage-sourced converters. The book: Describes various functions that the VSC can perform in electric power systems Covers a wide range of applications of the VSC in electric power systems—including wind power conversion systems Adopts a systematic approach to the modeling and control design problems Illustrates the control design procedures and expected performance based on a comprehensive set of examples and digital computer time-domain simulation studies This comprehensive text presents effective techniques for mathematical modeling and control design, and helps readers understand the procedures and analysis steps. Detailed simulation case studies are included to highlight the salient points and verify the designs. *Voltage-Sourced Converters in Power Systems* is an ideal reference for senior undergraduate and graduate students in power engineering programs, practicing engineers who deal with grid integration and operation of distributed energy resource units, design engineers, and researchers in the area of electric power generation, transmission, distribution, and utilization.

Introduction to AC Machine Design - Thomas A. Lipo 2017-10-05

The only book on the market that emphasizes machine design beyond the basic principles of AC and DC machine behavior AC electrical machine design is a key skill set for developing competitive electric motors and generators for applications in industry, aerospace, and defense. This book presents a thorough treatment of AC machine design, starting from basic electromagnetic principles and continuing through the various design aspects of an induction machine. *Introduction to AC Machine Design* includes one chapter each on the design of permanent magnet machines, synchronous machines, and thermal design. It also offers a basic treatment of the use of finite elements to compute the magnetic field within a machine without interfering with the initial comprehension of the core subject matter. Based on the author's notes, as well as after years of classroom instruction, *Introduction to AC Machine Design*: Brings to light more advanced principles of machine design—not just the basic principles of AC and DC machine behavior Introduces electrical machine design to neophytes while also being a resource for experienced designers Fully examines AC machine design, beginning with basic electromagnetic principles Covers the many facets of the induction machine design *Introduction to AC Machine Design* is an important text for graduate school students studying the design of electrical machinery, and it will be of great interest to manufacturers of electrical machinery.

19. Internationales Stuttgarter Symposium - Michael Bargende 2019-05-24

In einer sich rasant verändernden Welt sieht sich die Automobilindustrie fast täglich mit neuen Herausforderungen konfrontiert: Der problematischer werdende Ruf des Dieselmotors, verunsicherte Verbraucher durch die in der Berichterstattung vermischte Thematik der Stickoxid- und Feinstaubemissionen, zunehmende Konkurrenz bei Elektroantrieben durch neue Wettbewerber, die immer

schwieriger werdende öffentlichkeitswirksame Darstellung, dass ein großer Unterschied zwischen Prototypen, Kleinserien und einer wirklichen Großserienproduktion besteht. Dazu kommen noch die Fragen, wann die mit viel finanziellem Einsatz entwickelten alternativen Antriebsformen tatsächlich einen Return of Invest erbringen, wer die notwendige Ladeinfrastruktur für eine Massenmarktauglichkeit der Elektromobilität bauen und finanzieren wird und wie sich das alles auf die Arbeitsplätze auswirken wird. Für die Automobilindustrie ist es jetzt wichtiger denn je, sich den Herausforderungen aktiv zu stellen und innovative Lösungen unter Beibehaltung des hohen Qualitätsanspruchs der OEMs in Serie zu bringen. Die Hauptthemen sind hierbei, die Elektromobilität mit höheren Energiedichten und niedrigeren Kosten der Batterien voranzutreiben und eine wirklich ausreichende, standardisierte und zukunftsichere Ladeinfrastruktur darzustellen, aber auch den Entwicklungspfad zum schadstofffreien und CO₂-neutralen Verbrennungsmotor konsequent weiter zu gehen. Auch das automatisierte Fahren kann hier hilfreich sein, weil das Fahrzeugverhalten dann – im wahrsten Sinne des Wortes – kalkulierbar wird. Dabei ist es für die etablierten Automobilhersteller strukturell nicht immer einfach, mit der rasanten Veränderungsgeschwindigkeit mitzuhalten. Hier haben Start-ups einen großen Vorteil: Ihre Organisationsstruktur erlaubt es, frische, unkonventionelle Ideen zügig umzusetzen und sehr flexibel zu reagieren. Schon heute werden Start-ups gezielt gefördert, um neue Lösungen im Bereich von Komfort, Sicherheit, Effizienz und neuen Kundenschnittstellen zu finden. Neue Lösungsansätze, gepaart mit Investitionskraft und Erfahrungen, bieten neue Chancen auf dem Weg der Elektromobilität, der Zukunft des Verbrennungsmotors und ganz allgemein für das Auto der Zukunft.

Pulsewidth Modulated DC-to-DC Power Conversion - Byungcho Choi 2013-07-30

This is the definitive reference for anyone involved in pulsewidth modulated DC-to-DC power conversion. Pulsewidth Modulated DC-to-DC Power Conversion: Circuits, Dynamics, and Control Designs provides engineers, researchers, and students in the power electronics field with comprehensive and complete guidance to understanding pulsewidth modulated (PWM) DC-to-DC power converters. Presented in three parts, the book addresses the circuitry and operation of PWM DC-to-DC converters and their dynamic characteristics, along with in-depth discussions of control design of PWM DC-to-DC converters. Topics include: Basics of DC-to-DC power conversion DC-to-DC converter circuits Dynamic modeling Power stage dynamics Closed-loop performance Voltage mode control and feedback design Current mode control and compensation design Sampling effects of current mode control Featuring fully tested problems and simulation examples as well as downloadable lecture slides and ready-to-run PSpice programs, Pulsewidth Modulated DC-to-DC Power Conversion is an ideal reference book for professional engineers as well as graduate and undergraduate students.

Sliding Mode Control of Switching Power Converters - Siew-Chong Tan 2018-09-03

Sliding Mode Control of Switching Power Converters: Techniques and Implementation is perhaps the first in-depth account of how sliding mode controllers can be practically engineered to optimize control of power converters. A complete understanding of this process is timely and necessary, as the electronics industry moves toward the use of renewable energy sources and widely varying loads that can be adequately supported only by power converters using nonlinear controllers. Of the various advanced control methods used to handle the complex requirements of power conversion systems, sliding mode control (SMC) has been most widely investigated and proved to be a more feasible alternative than fuzzy and adaptive control for existing and future power converters. Bridging the gap between power

electronics and control theory, this book employs a top-down instructional approach to discuss traditional and modern SMC techniques. Covering everything from equations to analog implementation, it: Provides a comprehensive general overview of SMC principles and methods Offers advanced readers a systematic exposition of the mathematical machineries and design principles relevant to construction of SMC, then introduces newer approaches Demonstrates the practical implementation and supporting design rules of SMC, based on analog circuits Promotes an appreciation of general nonlinear control by presenting it from a practical perspective and using familiar engineering terminology With specialized coverage of modeling and implementation that is useful to students and professionals in electrical and electronic engineering, this book clarifies SMC principles and their application to power converters. Making the material equally accessible to all readers, whether their background is in analog circuit design, power electronics, or control engineering, the authors—experienced researchers in their own right—elegantly and practically relate theory, application, and mathematical concepts and models to corresponding industrial targets.

Model Predictive Control of High Power Converters and Industrial Drives - Tobias Geyer 2017-02-28

In this original book on model predictive control (MPC) for power electronics, the focus is put on high-power applications with multilevel converters operating at switching frequencies well below 1 kHz, such as medium-voltage drives and modular multi-level converters. Consisting of two main parts, the first offers a detailed review of three-phase power electronics, electrical machines, carrier-based pulse width modulation, optimized pulse patterns, state-of-the-art converter control methods and the principle of MPC. The second part is an in-depth treatment of MPC methods that fully exploit the performance potential of high-power converters. These control methods combine the fast control responses of deadbeat control with the optimal steady-state performance of optimized pulse patterns by resolving the antagonism between the two. MPC is expected to evolve into the control method of choice for power electronic systems operating at low pulse numbers with multiple coupled variables and tight operating constraints. Model Predictive Control of High Power Converters and Industrial Drives will enable the reader to learn how to increase the power capability of the converter, lower the current distortions, reduce the filter size, achieve very fast transient responses and ensure the reliable operation within safe operating area constraints. Targeted at power electronic practitioners working on control-related aspects as well as control engineers, the material is intuitively accessible, and the mathematical formulations are augmented by illustrations, simple examples and a book companion website featuring animations. Readers benefit from a concise and comprehensive treatment of MPC for industrial power electronics, enabling them to understand, implement and advance the field of high-performance MPC schemes.

Pulse Width Modulated DC-DC Converters - Keng Chih Wu 2012-12-06

For the first time in power electronics, this comprehensive treatment of switch-mode DC/DC converter designs addresses many analytical closed form equations such as duty cycle prediction, output regulation, output ripple, control loop-gain, and steady state time-domain waveform. Each of these equations are given various topologies and configurations, including forward, flyback, and boost converters. Pulse Width Modulated DC/DC Converters begins with a detailed approach to the quiescent operating locus of a power plant under open-loop. The reader is then led through other supporting circuits once again in the quiescent condition. These exercises result in the close-loop formulations of the subject system, providing

designers with the ability to study the sensitivities of a system against disturbances. With the quiescent conditions well established, the book then guides the reader further into the territories of system stability where small signal behaviors are explored. Finally, some important large signal time-domain studies cap the treatment. Some distinctive features of this book include: *detailed coverage of dynamic close-loop converter simulations using only personal computer and modern mathematical software *Steady-state, time-domain analysis based on the concept of continuity of states Voltage-mode and current-mode control techniques and their differences of merits A detailed description on setting up different equations for DC/DC converters'simulation using only PC

Introduction to Modern Power Electronics - Andrzej M. Trzynadlowski 2015-11-16

Provides comprehensive coverage of the basic principles and methods of electric power conversion and the latest developments in the field This book constitutes a comprehensive overview of the modern power electronics. Various semiconductor power switches are described, complementary components and systems are presented, and power electronic converters that process power for a variety of applications are explained in detail. This third edition updates all chapters, including new concepts in modern power electronics. New to this edition is extended coverage of matrix converters, multilevel inverters, and applications of the Z-source in cascaded power converters. The book is accompanied by a website hosting an instructor's manual, a PowerPoint presentation, and a set of PSpice files for simulation of a variety of power electronic converters. Introduction to Modern Power Electronics, Third Edition: Discusses power conversion types: ac-to-dc, ac-to-ac, dc-to-dc, and dc-to-ac Reviews advanced control methods used in today's power electronic converters Includes an extensive body of examples, exercises, computer assignments, and simulations Introduction to Modern Power Electronics, Third Edition is written for undergraduate and graduate engineering students interested in modern power electronics and renewable energy systems. The book can also serve as a reference tool for practicing electrical and industrial engineers. *Power Converters and AC Electrical Drives with Linear Neural Networks* - Maurizio Cirrincione 2017-12-19

The first book of its kind, *Power Converters and AC Electrical Drives with Linear Neural Networks* systematically explores the application of neural networks in the field of power electronics, with particular emphasis on the sensorless control of AC drives. It presents the classical theory based on space-vectors in identification, discusses control of electrical drives and power converters, and examines improvements that can be attained when using linear neural networks. The book integrates power electronics and electrical drives with artificial neural networks (ANN). Organized into four parts, it first deals with voltage source inverters and their control. It then covers AC electrical drive control, focusing on induction and permanent magnet synchronous motor drives. The third part examines theoretical aspects of linear neural networks, particularly the neural EXIN family. The fourth part highlights original applications in electrical drives and power quality, ranging from neural-based parameter estimation and sensorless control to distributed generation systems from renewable sources and active power filters. Simulation and experimental results are provided to validate the theories. Written by experts in the field, this state-of-the-art book requires basic knowledge of electrical machines and power electronics, as well as some familiarity with control systems, signal processing, linear algebra, and numerical analysis. Offering multiple paths through the material, the text is suitable for undergraduate and postgraduate students, theoreticians, practicing engineers, and

researchers involved in applications of ANNs.

Power Electronics Basics - Yuriy Rozanov 2015-04-23

Power Electronics Basics: Operating Principles, Design, Formulas, and Applications provides fundamental knowledge for the analysis and design of modern power electronic devices. This concise and user-friendly resource: Explains the basic concepts and most important terms of power electronics Describes the power assemblies, control, and passive components of semiconductor power switches Covers the control of power electronic devices, from mathematical modeling to the analysis of the electrical processes Addresses pulse-width modulation, power quality control, and multilevel, modular, and multicell power converter topologies Discusses line-commutated and resonant converters, as well as inverters and AC converters based on completely controllable switches Explores cutting-edge applications of power electronics, including renewable energy production and storage, fuel cells, and electric drives *Power Electronics Basics: Operating Principles, Design, Formulas, and Applications* supplies graduate students, industry professionals, researchers, and academics with a solid understanding of the underlying theory, while offering an overview of the latest achievements and development prospects in the power electronics industry.

Multilevel Inverters - Ersan Kabalci 2021-02-14

Multilevel Inverters: Topologies, Control Methods, and Applications investigates modern device topologies, control methods, and application areas for the rapidly developing conversion technology. The device topologies section begins with conventional two-level inverter topologies to provide a background on the DC-AC power conversion process and required circuit configurations. Thereafter, multilevel topologies originating from neutral point clamped topologies are presented in detail. The improved and inherited regular multilevel topologies such as flying capacitor and conventional H-bridge topology are presented to illustrate the multilevel concept. Emerging topologies are introduced regarding application areas such as renewable energy sources, electric vehicles, and power systems. The book goes on to discuss fundamental operational principles of inverters using the conventional pulse width modulated control method. Current and voltage based closed loop control methods such as repetitive control, space vector modulation, proportional resonant control and other recent methods are developed. Core modern applications including wind energy, photovoltaics, microgrids, hybrid microgrids, electric vehicles, active filters, and static VAR compensators are investigated in depth. *Multilevel Inverters for Emergent Topologies and Advanced Power Electronics Applications* is a valuable resource for electrical engineering specialists, smart grid specialists, researchers on electrical, power systems, and electronics engineering, energy and computer engineers. Reviews mathematical modeling and step-by-step simulation examples, straddling both basic and advanced topologies Assesses how to systematically deploy and control multilevel power inverters in application scenarios Reviews key applications across wind energy, photovoltaics, microgrids, hybrid microgrids, electric vehicles, active filters, static VAR compensators

Modular Multilevel Converters - Sixing Du 2018-02-22

An invaluable academic reference for the area of high-power converters, covering all the latest developments in the field High-power multilevel converters are well known in industry and academia as one of the preferred choices for efficient power conversion. Over the past decade, several power converters have been developed and commercialized in the form of standard and customized products that power a wide range of industrial applications. Currently, the modular multilevel converter is a

fast-growing technology and has received wide acceptance from both industry and academia. Providing adequate technical background for graduate- and undergraduate-level teaching, this book includes a comprehensive analysis of the conventional and advanced modular multilevel converters employed in motor drives, HVDC systems, and power quality improvement. *Modular Multilevel Converters: Analysis, Control, and Applications* provides an overview of high-power converters, reference frame theory, classical control methods, pulse width modulation schemes, advanced model predictive control methods, modeling of ac drives, advanced drive control schemes, modeling and control of HVDC systems, active and reactive power control, power quality problems, reactive power, harmonics and unbalance compensation, modeling and control of static synchronous compensators (STATCOM) and unified power quality

compensators. Furthermore, this book: Explores technical challenges, modeling, and control of various modular multilevel converters in a wide range of applications such as transformer and transformerless motor drives, high voltage direct current transmission systems, and power quality improvement Reflects the latest developments in high-power converters in medium-voltage motor drive systems Offers design guidance with tables, charts graphs, and MATLAB simulations *Modular Multilevel Converters: Analysis, Control, and Applications* is a valuable reference book for academic researchers, practicing engineers, and other professionals in the field of high power converters. It also serves well as a textbook for graduate-level students.