

Advanced Electric Drives Analysis Control And Modeling Using Matlab Simulink

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Control of Electrical Drives - Werner Leonhard 2012-12-06
Electrical drives play an important part as

electromechanical energy converters in transportation, materials handling and most production processes. This book presents a

unified treatment of complete electrical drive systems, including the mechanical parts, electrical machines, and power converters and control. Since it was first published in 1985 the book has found its way onto many desks in industry and universities all over the world. For the second edition the text has been thoroughly revised and updated, with the aim of offering the reader a general view of the field of controlled electrical drives, which are maintaining and extending their importance as the most flexible source of controlled mechanical energy.

[Advanced Control Systems for Electric Drives](#) -

Adel Merabet 2020-12-07

This book provides extensive information about advanced control techniques in electric drives. Multiple control and estimation methods are studied for position and speed tracking in different drives. Artificial intelligence tools, such as fuzzy logic and neural networks, are used for specific applications using electric drives.

Control of Electric Machine Drive Systems -

Seung-Ki Sul 2011-04-20

A unique approach to sensorless control and regulator design of electric drives Based on the author's vast industry experience and collaborative works with other industries, *Control of Electric Machine Drive Systems* is packed with tested, implemented, and verified ideas that engineers can apply to everyday problems in the field. Originally published in Korean as a textbook, this highly practical updated version features the latest information on the control of electric machines and apparatus, as well as a new chapter on sensorless control of AC machines, a topic not covered in any other publication. The book begins by explaining the features of the electric drive system and trends of development in related technologies, as well as the basic structure and operation principles of the electric machine. It also addresses steady state characteristics and control of the machines and the transformation of physical variables of AC

machines using reference frame theory in order to provide a proper foundation for the material. The heart of the book reviews several control algorithms of electric machines and power converters, explaining active damping and how to regulate current, speed, and position in a feedback manner. Seung-Ki Sul introduces tricks to enhance the control performance of the electric machines, and the algorithm to detect the phase angle of an AC source and to control DC link voltages of power converters. Topics also covered are: Vector control Control algorithms for position/speed sensorless drive of AC machines Methods for identifying the parameters of electric machines and power converters The matrix algebra to model a three-phase AC machine in d-q-n axes Every chapter features exercise problems drawn from actual industry experience. The book also includes more than 300 figures and offers access to an FTP site, which provides MATLAB programs for selected problems. The book's practicality and

realworld relatability make it an invaluable resource for professionals and engineers involved in the research and development of electric machine drive business, industrial drive designers, and senior undergraduate and graduate students. To obtain instructor materials please send an email to pressbooks@ieee.org To visit this book's FTP site to download MATLAB codes, please click on this link:

ftp://ftp.wiley.com/public/sci_tech_med/electric_machine/ MATLAB codes are also downloadable from Wiley Booksupport Site at <http://booksupport.wiley.com>

Electric Machines - Ion Boldea 2021-10-08
This Second Edition extensively covers advanced issues/subjects in electric machines, starting from principles, to applications and case studies with ample graphical (numerical) results. This textbook is intended for second (and third) semester courses covering topics such as modeling of transients, control principles,

electromagnetic and thermal finite element analysis, and optimal design (dimensioning). Notable recent knowledge with strong industrialization potential has been added to this edition, such as: Orthogonal models of multiphase a.c. machines Thermal Finite Element Analysis of (FEA) electric machines FEA-based-only optimal design of a PM motor case study Line start synchronizing premium efficiency PM induction machines Induction machines (three and single phase), synchronous machines with DC excitation, with PM-excitation, and with magnetically salient rotor and a linear Pm oscillatory motor are all investigated in terms of transients, electromagnetic FEM analysis and control principles. Case studies, numerical examples, and lots of discussion of FEM results for PMSM and IM are included throughout the book. The optimal design is treated in detail using Hooke-Jeeves and GA algorithms with case comparison studies in dedicated chapters for IM

and PMSM. Numerous computer simulation programs in MATLAB® and Simulink® are available online that illustrate performance characteristics present in the chapters, and the FEM and optimal design case studies (and codes) may be used as homework to facilitate a deeper understanding of fundamental issues.

Advanced Direct Thrust Force Control of Linear Permanent Magnet Synchronous Motor - Muhammad Ali Masood Cheema
2020-02-13

This book explores the direct thrust force control (DTFC) of tubular surface-mount linear permanent magnet synchronous motors (linear PMSMs). It presents a detailed account and analysis of several advanced nonlinear control schemes, based on the direct thrust control principle, to achieve a reduction in steady-state ripple in thrust force with faster transient response, and describes their experimental validation. It also provides rigorous details of the dynamic modelling of linear PMSMs from a

control system perspective, and demonstrates the superior control performance of the proposed techniques compared to the current state-of-the-art techniques. Lastly, the book proposes and validates a stator flux observer for sensorless speed estimation comprising a linear state observer and an improved sliding mode component.

Power Electronics and Electric Drives for Traction Applications - Gonzalo Abad

2016-11-14

Power Electronics and Electric Drives for Traction Applications offers a practical approach to understanding power electronics applications in transportation systems ranging from railways to electric vehicles and ships. It is an application-oriented book for the design and development of traction systems accompanied by a description of the core technology. The first four introductory chapters describe the common knowledge and background required to understand the preceding chapters. After that,

each application-specific chapter: highlights the significant manufacturers involved; provides a historical account of the technological evolution experienced; distinguishes the physics and mechanics; and where possible, analyses a real life example and provides the necessary models and simulation tools, block diagrams and simulation based validations. Key features: Surveys power electronics state-of-the-art in all aspects of traction applications. Presents vital design and development knowledge that is extremely important for the professional community in an original, simple, clear and complete manner. Offers design guidelines for power electronics traction systems in high-speed rail, ships, electric/hybrid vehicles, elevators and more applications. Application-specific chapters co-authored by traction industry expert. Learning supplemented by tutorial sections, case studies and MATLAB/Simulink-based simulations with data from practical systems. A valuable reference for application engineers in traction

industry responsible for design and development of products as well as traction industry researchers, developers and graduate students on power electronics and motor drives needing a reference to the application examples.

Advanced Electrical Drives - Rik W. De Doncker 2020-08-21

This book provides a unique approach to derive model-based torque controllers for all types of Lorentz force machines, i.e. DC, synchronous and induction machines. The rotating transformer model forms the basis for the generalized modeling approach of rotating field machines, which leads to the development of universal field-oriented control algorithms. Contrary to this, direct torque control algorithms, using observer-based methods, are developed for switched reluctance machines. Tutorials are included at the end of each chapter, and the reader is encouraged to execute these tutorials in order to gain familiarity with the dynamic behavior of drive

systems. This updated edition uses PLECS® simulation and vector processing tools that were specifically adopted for the purpose of these hands-on tutorials. Hence, Advanced Electrical Drives encourages “learning by doing” and the experienced drive specialist may find the simulation tools useful to design high-performance torque controllers. Although it is a powerful reference in its own right, when used in conjunction with the companion texts Fundamentals of Electrical Drives and Applied Control of Electrical Drives, this book provides a uniquely comprehensive reference set that takes readers all the way from understanding the basics of how electrical drives work, to deep familiarity with advanced features and models, to a mastery of applying the concepts to actual hardware in practice. Teaches readers to perform insightful analysis of AC electrical machines and drives; Introduces new modeling methods and modern control techniques for switched reluctance drives; Updated to use

PLECS® simulation tools for modeling electrical drives, including new and more experimental results; Numerous tutorials at end of each chapter to learn by doing, step-by-step; Includes extra material featuring “build and play” lab modules, for lectures and self-study.

Applied Control of Electrical Drives - Duco W. J. Pulle 2018-03-30

- Provides an overall understanding of all aspects of AC electrical drives, from the motor and converter to the implemented control algorithm, with minimum mathematics needed ·

- Demonstrates how to implement and debug electrical drive systems using a set of dedicated hardware platforms, motor setup and software tools in VisSim™ and PLECS™ · No expert programming skills required, allowing the reader to concentrate on drive development ·

- Enables the reader to undertake real-time control of a safe (low voltage) and low cost experimental drive This book puts the fundamental and advanced concepts behind

electric drives into practice. Avoiding involved mathematics whenever practical, this book shows the reader how to implement a range of modern day electrical drive concepts, without requiring in depth programming skills. It allows the user to build and run a series of AC drive concepts, ranging from very basic drives to sophisticated sensorless drives. Hence the book is the only modern resource available that bridges the gap between simulation and the actual experimental environment. Engineers who need to implement an electrical drive, or transition from sensed to sensorless drives, as well as students who need to understand the practical aspects of working with electrical drives, will greatly benefit from this unique reference.

Analysis and Control of Electric Drives - Ned Mohan 2020-08-27

A guide to drives essential to electric vehicles, wind turbines, and other motor-driven systems Analysis and Control of Electric Drives is a

practical and comprehensive text that offers a clear understanding of electric drives and their industrial applications in the real-world including electric vehicles and wind turbines. The authors—*noted experts on the topic*—review the basic knowledge needed to understand electric drives and include the pertinent material that examines DC and AC machines in steady state using a unique physics-based approach. The book also analyzes electric machine operation under dynamic conditions, assisted by Space Vectors. The book is filled with illustrative examples and includes information on electric machines with Interior Permanent Magnets. To enhance learning, the book contains end-of-chapter problems and all topics covered use computer simulations with MATLAB Simulink® and Sciamble® Workbench software that is available free online for educational purposes. This important book: Explores additional topics such as electric machines with Interior Permanent Magnets Includes multiple examples

and end-of-chapter homework problems Provides simulations made using MATLAB Simulink® and Sciamble® Workbench, free software for educational purposes Contains helpful presentation slides and Solutions Manual for Instructors; simulation files are available on the associated website for easy implementation A unique feature of this book is that the simulations in Sciamble® Workbench software can seamlessly be used to control experiments in a hardware laboratory Written for undergraduate and graduate students, Analysis and Control of Electric Drives is an essential guide to understanding electric vehicles, wind turbines, and increased efficiency of motor-driven systems.

Analysis of Electric Machinery and Drive Systems - Paul C. Krause 2013-06-17

Introducing a new edition of the popular reference on machine analysis Now in a fully revised and expanded edition, this widely used reference on machine analysis boasts many

changes designed to address the varied needs of engineers in the electric machinery, electric drives, and electric power industries. The authors draw on their own extensive research efforts, bringing all topics up to date and outlining a variety of new approaches they have developed over the past decade. Focusing on reference frame theory that has been at the core of this work since the first edition, this volume goes a step further, introducing new material relevant to machine design along with numerous techniques for making the derivation of equations more direct and easy to use. Coverage includes: Completely new chapters on winding functions and machine design that add a significant dimension not found in any other text A new formulation of machine equations for improving analysis and modeling of machines coupled to power electronic circuits Simplified techniques throughout, from the derivation of torque equations and synchronous machine analysis to the analysis of unbalanced operation

A unique generalized approach to machine parameters identification A first-rate resource for engineers wishing to master cutting-edge techniques for machine analysis, *Analysis of Electric Machinery and Drive Systems* is also a highly useful guide for students in the field. *Modern Electrical Drives* - H. Bülent Ertan 2013-06-29

Electrical drives lie at the heart of most industrial processes and make a major contribution to the comfort and high quality products we all take for granted. They provide the controller power needed at all levels, from megawatts in cement production to milliwatts in wrist watches. Other examples are legion, from the domestic kitchen to public utilities. The modern electrical drive is a complex item, comprising a controller, a static converter and an electrical motor. Some can be programmed by the user. Some can communicate with other drives. Semiconductor switches have improved, intelligent power modules have been introduced,

all of which means that control techniques can be used now that were unimaginable a decade ago. Nor has the motor side stood still: high-energy permanent magnets, semiconductor switched reluctance motors, silicon micromotor technology, and soft magnetic materials produced by powder technology are all revolutionising the industry. But the electric drive is an enabling technology, so the revolution is rippling throughout the whole of industry.

Advanced Electric Drives - Ned Mohan
2014-07-22

With nearly two-thirds of global electricity consumed by electric motors, it should come as no surprise that their proper control represents appreciable energy savings. The efficient use of electric drives also has far-reaching applications in such areas as factory automation (robotics), clean transportation (hybrid-electric vehicles), and renewable (wind and solar) energy resource management. *Advanced Electric Drives* utilizes a

physics-based approach to explain the fundamental concepts of modern electric drive control and its operation under dynamic conditions. Author Ned Mohan, a decades-long leader in Electrical Energy Systems (EES) education and research, reveals how the investment of proper controls, advanced MATLAB and Simulink simulations, and careful forethought in the design of energy systems translates to significant savings in energy and dollars. Offering students a fresh alternative to standard mathematical treatments of dq-axis transformation of a-b-c phase quantities, Mohan's unique physics-based approach "visualizes" a set of representative dq windings along an orthogonal set of axes and then relates their currents and voltages to the a-b-c phase quantities. *Advanced Electric Drives* is an invaluable resource to facilitate an understanding of the analysis, control, and modelling of electric machines. • Gives readers a "physical" picture of electric machines and

drives without resorting to mathematical transformations for easy visualization • Confirms the physics-based analysis of electric drives mathematically • Provides readers with an analysis of electric machines in a way that can be easily interfaced to common power electronic converters and controlled using any control scheme • Makes the MATLAB/Simulink files used in examples available to anyone in an accompanying website • Reinforces fundamentals with a variety of discussion questions, concept quizzes, and homework problems

Electric Vehicle Machines and Drives - K. T. Chau 2015-05-13

A timely comprehensive reference consolidates the research and development of electric vehicle machines and drives for electric and hybrid propulsions • Focuses on electric vehicle machines and drives • Covers the major technologies in the area including fundamental concepts and applications • Emphasis the design

criteria, performance analyses and application examples or potentials of various motor drives and machine systems • Accompanying website includes the simulation models and outcomes as supplementary material

Electric Powertrain - John G. Hayes 2018-02-05
The why, what and how of the electric vehicle powertrain Empowers engineering professionals and students with the knowledge and skills required to engineer electric vehicle powertrain architectures, energy storage systems, power electronics converters and electric drives. The modern electric powertrain is relatively new for the automotive industry, and engineers are challenged with designing affordable, efficient and high-performance electric powertrains as the industry undergoes a technological evolution. Co-authored by two electric vehicle (EV) engineers with decades of experience designing and putting into production all of the powertrain technologies presented, this book provides readers with the hands-on knowledge,

skills and expertise they need to rise to that challenge. This four-part practical guide provides a comprehensive review of battery, hybrid and fuel cell EV systems and the associated energy sources, power electronics, machines, and drives. The first part of the book begins with a historical overview of electromobility and the related environmental impacts motivating the development of the electric powertrain. Vehicular requirements for electromechanical propulsion are then presented. Battery electric vehicles (BEV), fuel cell electric vehicles (FCEV), and conventional and hybrid electric vehicles (HEV) are then described, contrasted and compared for vehicle propulsion. The second part of the book features in-depth analysis of the electric powertrain traction machines, with a particular focus on the induction machine and the surface- and interior-permanent magnet ac machines. The brushed dc machine is also considered due to its ease of operation and understanding, and its historical

place, especially as the traction machine on NASA's Mars rovers. The third part of the book features the theory and applications for the propulsion, charging, accessory, and auxiliary power electronics converters. Chapters are presented on isolated and non-isolated dc-dc converters, traction inverters, and battery charging. The fourth part presents the introductory and applied electromagnetism required as a foundation throughout the book. • Introduces and holistically integrates the key EV powertrain technologies. • Provides a comprehensive overview of existing and emerging automotive solutions. • Provides experience-based expertise for vehicular and powertrain system and sub-system level study, design, and optimization. • Presents many examples of powertrain technologies from leading manufacturers. • Discusses the dc traction machines of the Mars rovers, the ultimate EVs from NASA. • Investigates the environmental motivating factors and impacts of

electromobility. • Presents a structured university teaching stream from introductory undergraduate to postgraduate. • Includes real-world problems and assignments of use to design engineers, researchers, and students alike. • Features a companion website with numerous references, problems, solutions, and practical assignments. • Includes introductory material throughout the book for the general scientific reader. • Contains essential reading for government regulators and policy makers. *Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles* is an important professional resource for practitioners and researchers in the battery, hybrid, and fuel cell EV transportation industry. The book is a structured holistic textbook for the teaching of the fundamental theories and applications of energy sources, power electronics, and electric machines and drives to engineering undergraduate and postgraduate students. Textbook Structure and

Suggested Teaching Curriculum This is primarily an engineering textbook covering the automotive powertrain, energy storage and energy conversion, power electronics, and electrical machines. A significant additional focus is placed on the engineering design, the energy for transportation, and the related environmental impacts. This textbook is an educational tool for practicing engineers and others, such as transportation policy planners and regulators. The modern automobile is used as the vehicle upon which to base the theory and applications, which makes the book a useful educational reference for our industry colleagues, from chemists to engineers. This material is also written to be of interest to the general reader, who may have little or no interest in the power electronics and machines. Introductory science, mathematics, and an inquiring mind suffice for some chapters. The general reader can read the introduction to each of the chapters and move to the next as soon as the material gets too

advanced for him or her. Part I Vehicles and Energy Sources Chapter 1 Electromobility and the Environment Chapter 2 Vehicle Dynamics Chapter 3 Batteries Chapter 4 Fuel Cells Chapter 5 Conventional and Hybrid Powertrains Part II Electrical Machines Chapter 6 Introduction to Traction Machines Chapter 7 The Brushed DC Machine Chapter 8 Induction Machines Chapter 9 Surface-permanent-magnet AC Machines Chapter 10: Interior-permanent-magnet AC Machines Part III Power Electronics Chapter 11 DC-DC Converters Chapter 12 Isolated DC-DC Converters Chapter 13 Traction Drives and Three-phase Inverters Chapter 14 Battery Charging Chapter 15 Control of the Electric Drive Part IV Basics Chapter 16 Introduction to Electromagnetism, Ferromagnetism, and Electromechanical Energy Conversion The first third of the book (Chapters 1 to 6), plus parts of Chapters 14 and 16, can be taught to the general science or engineering student in the second or third year. It covers the

introductory automotive material using basic concepts from mechanical, electrical, environmental, and electrochemical engineering. Chapter 14 on electrical charging and Chapter 16 on electromagnetism can also be used as a general introduction to electrical engineering. The basics of electromagnetism, ferromagnetism and electromechanical energy conversion (Chapter 16) and dc machines (Chapter 7) can be taught to second year (sophomore) engineering students who have completed introductory electrical circuits and physics. The third year (junior) students typically have covered ac circuit analysis, and so they can cover ac machines, such as the induction machine (Chapter 8) and the surface permanent-magnet ac machine (Chapter 9). As the students typically have studied control theory, they can investigate the control of the speed and torque loops of the motor drive (Chapter 15). Power electronics, featuring non-isolated buck and boost converters (Chapter 11), can also be

introduced in the third year. The final-year (senior) students can then go on to cover the more advanced technologies of the interior-permanent-magnet ac machine (Chapter 10). Isolated power converters (Chapter 12), such as the full-bridge and resonant converters, inverters (Chapter 13), and power-factor-corrected battery chargers (Chapter 14), are covered in the power electronics section. This material can also be covered at the introductory postgraduate level. Various homework, simulation, and research exercises are presented throughout the textbook. The reader is encouraged to attempt these exercises as part of the learning experience. Instructors are encouraged to contact the author, John Hayes, direct to discuss course content or structure.

Applied Intelligent Control of Induction Motor Drives - Tze Fun Chan 2011-01-19

Induction motors are the most important workhorses in industry. They are mostly used as constant-speed drives when fed from a voltage

source of fixed frequency. Advent of advanced power electronic converters and powerful digital signal processors, however, has made possible the development of high performance, adjustable speed AC motor drives. This book aims to explore new areas of induction motor control based on artificial intelligence (AI) techniques in order to make the controller less sensitive to parameter changes. Selected AI techniques are applied for different induction motor control strategies. The book presents a practical computer simulation model of the induction motor that could be used for studying various induction motor drive operations. The control strategies explored include expert-system-based acceleration control, hybrid-fuzzy/PI two-stage control, neural-network-based direct self control, and genetic algorithm based extended Kalman filter for rotor speed estimation. There are also chapters on neural-network-based parameter estimation, genetic-algorithm-based optimized random PWM strategy, and experimental

investigations. A chapter is provided as a primer for readers to get started with simulation studies on various AI techniques. Presents major artificial intelligence techniques to induction motor drives Uses a practical simulation approach to get interested readers started on drive development Authored by experienced scientists with over 20 years of experience in the field Provides numerous examples and the latest research results Simulation programs available from the book's Companion Website This book will be invaluable to graduate students and research engineers who specialize in electric motor drives, electric vehicles, and electric ship propulsion. Graduate students in intelligent control, applied electric motion, and energy, as well as engineers in industrial electronics, automation, and electrical transportation, will also find this book helpful. Simulation materials available for download at www.wiley.com/go/chanmotor

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.

Electric Drives - Vedam Subrahmanyam 1997-06

Modeling and Control of Power Electronic Converters for Microgrid Applications - Yang Han 2021-08-27

This book covers the fundamentals of power electronic converter modeling and control, digital simulation, and experimental studies in the area of renewable energy systems and AC/DC microgrid. Recent advanced control methods for voltage source inverters (VSIs) and the hierarchical controlled islanded microgrid are discussed, including the mathematical modeling, controller synthesis, parameter selection and multi-scale stability analysis, and consensus-based control strategies for the microgrid and microgrid clusters. The book will be an invaluable technical reference for practicing engineers and researchers working in the areas of renewable energy, power electronics, energy internet, and smart grid. It can also be utilized as reference book for undergraduate and postgraduate students in electrical engineering.

PID and Predictive Control of Electrical Drives and Power Converters using MATLAB / Simulink - Liuping Wang 2014-12-17

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.

Fundamentals of Electrical Drives - Andre Veltman 2016-06-10

The purpose of this book is to familiarize the reader with all aspects of electrical drives. It contains a comprehensive user-friendly introductory text.

[Sliding Mode Control for Synchronous Electric Drives](#) - Sergey E. Rvynkin 2011-11-21

This volume presents the theory of control systems with sliding mode applied to electrical motors and power converters. It demonstrates the methodology of control design and the original algorithms of control and observation. Practically all semiconductor devices are used in power converters, that feed electrical motors, as power switches. A switch

Electric Motors and Drives - Austin Hughes 2013-10-22

Written for non-specialist users of electric motors and drives, this book explains how electric drives work and compares the

performance of the main systems, with many examples of applications. The author's approach - using a minimum of mathematics - has made this book equally popular as an outline for professionals and an introductory student text. * First edition (1990) has sold over 6000 copies. Drives and Controls on the first edition: 'This book is very readable, up-to-date and should be extremely useful to both users and o.e.m. designers. I unhesitatingly recommend it to any busy engineer who needs to make informed judgements about selecting the right drive system.' New features of the second edition: * New section on the cycloconverter drive. * More on switched reluctance motor drives. * More on vector-controlled induction motor drives. * More on power switching devices. * New 'question and answer' sections on common problems and misconceptions. * Updating throughout. Electric Motors and Drives is for non-specialist users of electric motors and drives. It fills the gap between specialist textbooks (which are pitched

at a level which is too academic for the average user) and the more prosaic 'handbooks' which are filled with useful detail but provide little opportunity for the development of any real insight or understanding. The book explores most of the widely-used modern types of motor and drive, including conventional and brushless d.c., induction motors (mains and inverter-fed), stepping motors, synchronous motors (mains and converter-fed) and reluctance motors.

Electric Motor Drives: Modeling Analysis And Control - Krishnan

High Performance Control of AC Drives with Matlab/Simulink - Haitham Abu-Rub

2021-05-11

High Performance Control of AC Drives with Matlab®/Simulink Explore this indispensable update to a popular graduate text on electric drive techniques and the latest converters used in industry The Second Edition of High Performance Control of AC Drives with

Matlab®/Simulink delivers an updated and thorough overview of topics central to the understanding of AC motor drive systems. The book includes new material on medium voltage drives, covering state-of-the-art technologies and challenges in the industrial drive system, as well as their components, and control, current source inverter-based drives, PWM techniques for multilevel inverters, and low switching frequency modulation for voltage source inverters. This book covers three-phase and multiphase (more than three-phase) motor drives including their control and practical problems faced in the field (e.g., adding LC filters in the output of a feeding converter), are considered. The new edition contains links to Matlab®/Simulink models and PowerPoint slides ideal for teaching and understanding the material contained within the book. Readers will also benefit from the inclusion of: A thorough introduction to high performance drives, including the challenges and requirements for

electric drives and medium voltage industrial applications An exploration of mathematical and simulation models of AC machines, including DC motors and squirrel cage induction motors A treatment of pulse width modulation of power electronic DC-AC converter, including the classification of PWM schemes for voltage source and current source inverters Examinations of harmonic injection PWM and field-oriented control of AC machines Voltage source and current source inverter-fed drives and their control Modelling and control of multiphase motor drive system Supported with a companion website hosting online resources. Perfect for senior undergraduate, MSc and PhD students in power electronics and electric drives, High Performance Control of AC Drives with Matlab®/Simulink will also earn a place in the libraries of researchers working in the field of AC motor drives and power electronics engineers in industry.

Modeling, Simulation and Control of Electrical

Drives - Mohammed Fazlur Rahman 2019-07-27 Thanks to advances in power electronics device design, digital signal processing technologies and energy efficient algorithms, ac motors have become the backbone of the power electronics industry. Variable frequency drives (VFD's) together with IE3 and IE4 induction motors, permanent magnet motors, and synchronous reluctance motors have emerged as a new generation of greener high-performance technologies, which offer improvements to process and speed control, product quality, energy consumption and diagnostics analytics. Primarily intended for professionals and advanced students who are working on sensorless control, predictive control, direct torque control, speed control and power quality and optimisation techniques for electric drives, this edited book surveys state of the art novel control techniques for different types of ac machines. The book provides a framework of different modeling and control algorithms using

MATLAB®/Simulink®, and presents design, simulation and experimental verification techniques for the design of lower cost and more reliable and performant systems.

Electric Machines and Drives - Ned Mohan

2011-12-13

This book is part of a three-book series. Ned Mohan has been a leader in EES education and research for decades, as author of the best-selling text/reference Power Electronics. This book emphasizes applications of electric machines and drives that are essential for wind turbines and electric and hybrid-electric vehicles. The approach taken is unique in the following respects: A systems approach, where Electric Machines are covered in the context of the overall drives with applications that students can appreciate and get enthusiastic about; A fundamental and physics-based approach that not only teaches the analysis of electric machines and drives, but also prepares students for learning how to control them in a graduate

level course; Use of the space-vector-theory that is made easy to understand. They are introduced in this book in such a way that students can appreciate their physical basis; A unique way to describe induction machines that clearly shows how they go from the motoring-mode to the generating-mode, for example in wind and electric vehicle applications, and how they ought to be controlled for the most efficient operation.

Advanced Electric Drive Vehicles - Ali Emadi

2014-10-24

Electrification is an evolving paradigm shift in the transportation industry toward more efficient, higher performance, safer, smarter, and more reliable vehicles. There is in fact a clear trend to move from internal combustion engines (ICEs) to more integrated electrified powertrains. Providing a detailed overview of this growing area, Advanced Electric Drive Vehicles begins with an introduction to the automotive industry, an explanation of the need for electrification, and a presentation of the

fundamentals of conventional vehicles and ICEs. It then proceeds to address the major components of electrified vehicles—i.e., power electronic converters, electric machines, electric motor controllers, and energy storage systems. This comprehensive work: Covers more electric vehicles (MEVs), hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), range-extended electric vehicles (REEVs), and all-electric vehicles (EVs) including battery electric vehicles (BEVs) and fuel cell vehicles (FCVs) Describes the electrification technologies applied to nonpropulsion loads, such as power steering and air-conditioning systems Discusses hybrid battery/ultra-capacitor energy storage systems, as well as 48-V electrification and belt-driven starter generator systems Considers vehicle-to-grid (V2G) interface and electrical infrastructure issues, energy management, and optimization in advanced electric drive vehicles Contains numerous illustrations, practical examples, case studies, and challenging

questions and problems throughout to ensure a solid understanding of key concepts and applications Advanced Electric Drive Vehicles makes an ideal textbook for senior-level undergraduate or graduate engineering courses and a user-friendly reference for researchers, engineers, managers, and other professionals interested in transportation electrification.

Advanced Control of Electrical Drives and Power Electronic Converters - Jacek Kabziński
2016-09-30

This contributed volume is written by key specialists working in multidisciplinary fields in electrical engineering, linking control theory, power electronics, artificial neural networks, embedded controllers and signal processing. The authors of each chapter report the state of the art of the various topics addressed and present results of their own research, laboratory experiments and successful applications. The presented solutions concentrate on three main areas of interest: · motion control in complex

electromechanical systems, including sensorless control; · fault diagnosis and fault tolerant control of electric drives; · new control algorithms for power electronics converters. The chapters and the complete book possess strong monograph attributes. Important practical and theoretical problems are deeply and accurately presented on the background of an exhaustive state-of-the art review. Many results are completely new and were never published before. Well-known control methods like field oriented control (FOC) or direct torque control (DTC) are referred as a starting point for modifications or are used for comparison. Among numerous control theories used to solve particular problems are: nonlinear control, robust control, adaptive control, Lyapunov techniques, observer design, model predictive control, neural control, sliding mode control, signal filtration and processing, fault diagnosis, and fault tolerant control.

Emerging Power Converters for Renewable

Energy and Electric Vehicles - Md Rabiul Islam 2021-05-12

This book covers advancements of power electronic converters and their control techniques for grid integration of large-scale renewable energy sources and electrical vehicles. Major emphasis are on transformerless direct grid integration, bidirectional power transfer, compensation of grid power quality issues, DC system protection and grounding, interaction in mixed AC/DC system, AC and DC system stability, magnetic design for high-frequency high power density systems with advanced soft magnetic materials, modelling and simulation of mixed AC/DC system, switching strategies for enhanced efficiency, and protection and reliability for sustainable grid integration. This book is an invaluable resource for professionals active in the field of renewable energy and power conversion.

Modeling, Dynamics, and Control of Electrified Vehicles - Haiping Du 2017-10-19

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

Advanced Electrical Drives - Rik De Doncker
2010-11-30

Electrical drives convert in a controlled manner, electrical energy into mechanical energy. Electrical drives comprise an electrical machine, i.e. an electro-mechanical energy converter, a power electronic converter, i.e. an electrical-to-electrical converter, and a controller/communication unit. Today, electrical drives are used as propulsion systems in high-speed trains, elevators, escalators, electric ships, electric forklift trucks and electric vehicles. Advanced control algorithms (mostly digitally implemented) allow torque control over a high-bandwidth. Hence, precise motion control can be achieved. Examples are drives in robots, pick-and-place machines, factory automation hardware, etc. Most drives can operate in motoring and generating mode. Wind turbines use electrical drives to convert wind energy into

electrical energy. More and more, variable speed drives are used to save energy for example, in air-conditioning units, compressors, blowers, pumps and home appliances. Key to ensure stable operation of a drive in the aforementioned applications are torque control algorithms. In *Advanced Electrical Drives*, a unique approach is followed to derive model based torque controllers for all types of Lorentz force machines, i.e. DC, synchronous and induction machines. The rotating transformer model forms the basis for this generalized modeling approach that ultimately leads to the development of universal field-oriented control algorithms. In case of switched reluctance machines, torque observers are proposed to implement direct torque algorithms. From a didactic viewpoint, tutorials are included at the end of each chapter. The reader is encouraged to execute these tutorials to familiarize him or herself with all aspects of drive technology. Hence, *Advanced Electrical Drives* encourages

“learning by doing”. Furthermore, the experienced drive specialist may find the simulation tools useful to design high-performance controllers for all sorts of electrical drives.

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles - Mehrdad Ehsani 2018-02-02

"This book is an introduction to automotive technology, with specific reference to battery electric, hybrid electric, and fuel cell electric vehicles. It could serve electrical engineers who need to know more about automobiles or automotive engineers who need to know about electrical propulsion systems. For example, this reviewer, who is a specialist in electric machinery, could use this book to better understand the automobiles for which the reviewer is designing electric drive motors. An automotive engineer, on the other hand, might use it to better understand the nature of motors and electric storage systems for application in automobiles, trucks or motorcycles. The early

chapters of the book are accessible to technically literate people who need to know something about cars. While the first chapter is historical in nature, the second chapter is a good introduction to automobiles, including dynamics of propulsion and braking. The third chapter discusses, in some detail, spark ignition and compression ignition (Diesel) engines. The fourth chapter discusses the nature of transmission systems.” —James Kirtley, Massachusetts Institute of Technology, USA “The third edition covers extensive topics in modern electric, hybrid electric, and fuel cell vehicles, in which the profound knowledge, mathematical modeling, simulations, and control are clearly presented. Featured with design of various vehicle drivetrains, as well as a multi-objective optimization software, it is an estimable work to meet the needs of automotive industry.” —Haiyan Henry Zhang, Purdue University, USA “The extensive combined experience of the authors have produced an

extensive volume covering a broad range but detailed topics on the principles, design and architectures of Modern Electric, Hybrid Electric, and Fuel Cell Vehicles in a well-structured, clear and concise manner. The volume offers a complete overview of technologies, their selection, integration & control, as well as an interesting Technical Overview of the Toyota Prius. The technical chapters are complemented with example problems and user guides to assist the reader in practical calculations through the use of common scientific computing packages. It will be of interest mainly to research postgraduates working in this field as well as established academic researchers, industrial R&D engineers and allied professionals.” —Christopher Donaghy-Sparg, Durham University, United Kingdom The book deals with the fundamentals, theoretical bases, and design methodologies of conventional internal combustion engine (ICE) vehicles, electric vehicles (EVs), hybrid electric

vehicles (HEVs), and fuel cell vehicles (FCVs). The design methodology is described in mathematical terms, step-by-step, and the topics are approached from the overall drive train system, not just individual components. Furthermore, in explaining the design methodology of each drive train, design examples are presented with simulation results. All the chapters have been updated, and two new chapters on Mild Hybrids and Optimal Sizing and Dimensioning and Control are also included • Chapters updated throughout the text. • New homework problems, solutions, and examples. • Includes two new chapters. • Features accompanying MATLABTM software.

Electrical Machine Drives Control - Juha Pyrhonen 2016-10-10

This comprehensive text examines existing and emerging electrical drive technologies. The authors clearly define the most basic electrical drive concepts and go on to explain the most important details while maintaining a solid

connection to the theory and design of the associated electrical machines. Also including links to a number of industrial applications, the authors take their investigation of electrical drives beyond theory to examine a number of practical aspects of electrical drive control and application. Key features: * Provides a comprehensive summary of all aspects of controlled-speed electrical drive technology including control and operation. * Handling of electrical drives is solidly linked to the theory and design of the associated electrical machines. Added insight into problems and functions are illustrated with clearly understandable figures. * Offers an understanding of the main phenomena associated with electrical machine drives. * Considers the problem of bearing currents and voltage stresses of an electrical drive. * Includes up-to-date theory and design guidelines, taking into account the most recent advances. This book's rigorous coverage of theoretical principles and techniques makes for an excellent

introduction to controlled-speed electrical drive technologies for Electrical Engineering MSc or PhD students studying electrical drives. It also serves as an excellent reference for practicing electrical engineers looking to carry out design, analyses, and development of controlled-speed electrical drives.

Electric Drives and Electromechanical Systems - Richard Crowder 2006-02-02

The focus of this book on the selection and application of electrical drives and control systems for electromechanical and mechatronics applications makes it uniquely useful for engineers in industry working with machines and drives. It also serves as a student text for courses on motors and drives, and engineering design courses, especially within mechanical engineering and mechatronics degree programs. The criteria for motor-drive selection are explained, and the main types of drives available to drive machine tools and robots introduced. The author also provides a review of control

systems and their application, including PLCs and network technologies. The coverage of machine tools and high-performance drives in smaller applications makes this a highly practical book focused on the needs of students and engineers working with electromechanical systems. * An invaluable survey of electric drives and control systems for electromechanical and mechatronics applications * Essential reading for electrical and mechanical engineers using motors and drives * An ideal electric motors and drives text for university courses including mechatronics

Electric Drives - Ion Boldea 2016-09-15

Electric Drives provides a practical understanding of the subtleties involved in the operation of modern electric drives. The Third Edition of this bestselling textbook has been fully updated and greatly expanded to incorporate the latest technologies used to save energy and increase productivity, stability, and reliability. Every phrase, equation, number, and

reference in the text has been revisited, with the necessary changes made throughout. In addition, new references to key research and development activities have been included to accurately reflect the current state of the art. Nearly 120 new pages covering recent advances, such as those made in the sensorless control of A.C. motor drives, have been added; as have two new chapters on advanced scalar control and multiphase electric machine drives. All solved numerical examples have been retained, and the 10 MATLAB®-Simulink® programs remain online. Thus, *Electric Drives, Third Edition* offers an up-to-date synthesis of the basic and advanced control of electric drives, with ample material for a two-semester course at the university level.

[Power Electronics, Drives, and Advanced Applications](#) - Vinod Kumar 2020-03-27

Concern for reliable power supply and energy-efficient system design has led to usage of power electronics-based systems, including efficient

electric power conversion and power semiconductor devices. This book provides integration of complete fundamental theory, design, simulation and application of power electronics, and drives covering up-to-date subject components. It contains twenty-one chapters arranged in four sections on power semiconductor devices, basic power electronic converters, advanced power electronics converters, power supplies, electrical drives and advanced applications. Aimed at senior undergraduate and graduate students in electrical engineering and power electronics including related professionals, this book • Includes electrical drives such as DC motor, AC motor, special motor, high performance motor drives, solar, electrical/hybrid vehicle and fuel cell drives • Reviews advances in renewable energy technologies (wind, PV, hybrid power systems) and their integration • Explores topics like distributed generation, microgrid, and wireless power transfer system • Includes

simulation examples using MATLAB®/Simulink and over four hundred solved, unsolved and review problems

Advanced Electric Drives - Ned Mohan 2001

Basics of Electrical Drives - S. K. Pillai

2014-01-01

Discusses fundamentals of electrical drives, this book describes in detail dynamics of electrical drives; characteristics of dc and ac motors while starting, running and braking; and, determination of rating and heating of motors.

Advanced Electrical Drives - Rik W. De Doncker 2020-10-25

This book provides a unique approach to derive model-based torque controllers for all types of Lorentz force machines, i.e. DC, synchronous and induction machines. The rotating transformer model forms the basis for the generalized modeling approach of rotating field machines, which leads to the development of universal field-oriented control algorithms.

Contrary to this, direct torque control algorithms, using observer-based methods, are developed for switched reluctance machines. Tutorials are included at the end of each chapter, and the reader is encouraged to execute these tutorials in order to gain familiarity with the dynamic behavior of drive systems. This updated edition uses PLECS® simulation and vector processing tools that were specifically adopted for the purpose of these hands-on tutorials. Hence, Advanced Electrical Drives encourages “learning by doing” and the experienced drive specialist may find the simulation tools useful to design high-performance torque controllers. Although it is a powerful reference in its own right, when used in conjunction with the companion texts Fundamentals of Electrical Drives and Applied Control of Electrical Drives, this book provides a uniquely comprehensive reference set that takes readers all the way from understanding the basics of how electrical drives work, to deep

familiarity with advanced features and models, to a mastery of applying the concepts to actual hardware in practice. Teaches readers to perform insightful analysis of AC electrical machines and drives; Introduces new modeling methods and modern control techniques for switched reluctance drives; Updated to use PLECS® simulation tools for modeling electrical drives, including new and more experimental results; Numerous tutorials at end of each chapters to learn by doing, step-by-step; Includes extra material featuring “build and play” lab modules, for lectures and self-study.

Control of Multiphase Machines and Drives

- Federico Barrero 2020-01-24

With the growing interest in electrical machines in recent times, the multiphase machine field

has developed into a fascinating research area. Their intrinsic features (power splitting, better fault tolerance, or lower torque ripple) make them an appealing competitor to conventional three-phase machines. Multiphase electric drives have been recently used in applications where fault tolerance and continuous operation of the drive are required. However, the difficulties in extending the three-phase conventional current regulation and control structure to multiphase systems still limit their broad applicability in industry solutions. The main objective of this book is to illustrate new advances, developments, and applications in the field of multiphase machines and drives, while exposing these advances, developments, and applications to the scientific community and industry.