Chapter 4 Direct Torque Control And Sensor Less Control Of

Variable Speed Generators, the second of two volumes in the Electric Generators Handbook, provides extensive coverage of variable speed generators in distributed generation and renewable energy applications around the world. The book delves into the steady state, transients, control, and design of claw-pole-rotor synchronous, induction, permanent-magnet-(PM)-assisted synchronous, and switched reluctance starter alternators for electric hybrid vehicles. It discusses PM synchronous, transverse flux PM, and flux reversal PM generators for low-speed wind and hydro energy conversion. It also explores linear motion alternators for residential and spacecraft applications. Numerous design and control examples illustrate the exposition. Fully revised and updated to reflect the last decade's worth of progress in the field, this Second Edition adds new sections that: Address the ride-through control of doubly fed induction generators under unbalanced voltage sags Consider the control of stand-alone doubly fed induction generators under unbalanced nonlinear loads Detail a stand-alone squirrel cage induction generator (SCIG) with AC output and a low-rating pulse-width modulated (PWM) converter Present a twin stator winding SCIG with 50 percent rating inverter and diode rectifier, and a dual stator winding induction generator with nested cage rotor Examine interior permanent magnet claw-pole-alternator systems for more vehicle braking energy recuperation, and high power factor Vernier PM generators Depict a PM-assisted reluctance synchronous motor/generator for an electric hybrid vehicle, and a double stator switched reluctance generator with segmented rotor Describe the grid to stand-alone transition motion-sensorless dual-inverter control of permanent magnet synchronous generators with asymmetrical grid voltage sags and harmonics filtering The promise of renewable, sustainable energy rests on our ability to design innovative power systems that are able to harness energy from a variety of sources. Variable Speed Generators, Second Edition supplies state-of-the-art tools necessary to design, validate, and deploy the right power generation technologies to fulfill tomorrow's complex energy needs.

This book constitutes the refereed proceedings of the 8th International Workshop on Hybrid Systems: Computation and Control, HSCC 2005, held in Zurich, Switzerland in March 2005. The 40 revised full papers presented together with 2 invited papers and the abstract of an invited talk were carefully reviewed and selected from 91 submissions. The papers focus on modeling, analysis, and implementation of dynamic and reactive systems involving both discrete and continuous behaviors. Among the topics addressed are tools for analysis and verification, control and optimization, modeling, engineering applications, and emerging directions in programming language support and implementation.

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.

This book presents various computationally efficient component- and system-level design optimization methods for advanced electrical machines and drive systems. Readers will discover novel design optimization concepts developed by the authors and other researchers in the last decade, including application-oriented, multi-disciplinary, multi-objective, multi-level, deterministic, and robust design optimization methods. A multi-disciplinary analysis includes various aspects of materials, electromagnetics, thermotics, mechanics, power electronics, applied mathematics, manufacturing technology, and quality control and management. This book will benefit both researchers and engineers in the field of motor and drive design and manufacturing, thus enabling the effective development of the high-quality production of innovative, high-performance drive systems for challenging applications, such as green energy systems and electric vehicles.

A comprehensive guide to understanding AC machines with exhaustive simulation models to practice design and control Nearly seventy percent of the electricity generated worldwide is used by electrical motors. Worldwide, huge research efforts are being made to develop commercially viable three- and multi-phase motor drive systems that are economically and technically feasible. Focusing on the most popular AC machines used in industry – induction machine and permanent magnet synchronous machine – this book illustrates advanced control techniques and topologies in practice and recently deployed. Examples are drawn from important techniques including Vector Control, Direct Torque Control, Nonlinear Control, Predictive Control, multi-phase drives and multilevel inverters. Key features include: systematic coverage of the advanced concepts of AC motor drives with and without output filter; discussion on the modelling, analysis and control of three- and multi-phase AC machine drives, including the recently developed multi-phase-phase drive system and double fed induction machine; description of model predictive control applied to power converters and AC drives, illustrated together with their simulation models; end-of-chapter questions, with answers and PowerPoint slides available on the companion website www.wiley.com/go/aburub_control This book integrates a diverse range of topics into one useful volume, including most the latest developments. It provides an effective guideline for students and professionals on many vital electric drives aspects. It is an advanced textbook for final year undergraduate and graduate students, and researchers in power electronics, electric drives and motor control. It is also a handy tool for specialists

and practicing engineers wanting to develop and verify their own algorithms and techniques.

In high power, high voltage electronics systems, a strategy to manage short timescale energy imbalances is fundamental to the system reliability. Without a theoretical framework, harmful local convergence of energy can affect the dynamic process of transformation, transmission, and storage which create an unreliable system. With an original approach that encourages understanding of both macroscopic and microscopic factors, the authors offer a solution. They demonstrate the essential theory and methodology for the design, modeling and prototyping of modern power electronics converters to create highly effective systems. Current applications such as renewable energy systems and hybrid electric vehicles are discussed in detail by the authors. Key features: offers a logical guide that is widely applicable to power electronics across power supplies, renewable energy systems, and many other areas analyses the short-scale (nano-micro second) transient phenomena and the transient processes in nearly all major timescales, from device switching processes at the nanoscale level, to thermal and mechanical processes at second level explores transient causes and shows how to correct them by changing the control algorithm or peripheral circuit includes two case studies on power electronics in hybrid electric vehicles and renewable energy systems Practitioners in major power electronic companies will benefit from this reference, especially design engineers aiming for optimal system performance. It will also be of value to faculty staff and graduate students specializing in power electronics within academia.

AC motors play a major role in modern industrial applications. Squirrel-cage induction motors (SCIMs) are probably the most frequently used when compared to other AC motors because of their low cost, ruggedness, and low maintenance. The material presented in this book is organized into four sections, covering the applications and structural properties of induction motors (IMs), fault detection and diagnostics, control strategies, and the more recently developed topology based on the multiphase (more than three phases) induction motors. This material should be of specific interest to engineers and researchers who are engaged in the modeling, design, and implementation of control algorithms applied to induction motors and, more generally, to readers broadly interested in nonlinear control, health condition monitoring, and fault diagnosis.

[Effective Real Time Implementation of Deadbeat Direct Torque Control for AC Induction Machines](#)
[Optimization and Control of Electrical Machines](#)
[Model Predictive Control of Wind Energy Conversion Systems](#)
[Electric Drives](#)
[Modelling Analysis and Control](#)
[Advances in Motor Torque Control](#)
[Transients of Modern Power Electronics](#)
[Modelling and Control](#)

Analysis and Control of Electric Drives
Modeling and Modern Control of Wind Power

This book contains fifty-eight revised and extended research articles written by prominent researchers participating in the Advances in Engineering Technologies and Physical Science conference, held in London, U.K., 4-6 July, 2012. Topics covered include Applied and Engineering Mathematics, Computational Statistics, Mechanical Engineering, Bioengineering, Internet Engineering, Wireless Networks, Knowledge Engineering, Computational Intelligence, High Performance Computing, Manufacturing Engineering, and industrial applications. The book offers the state of art of tremendous advances in engineering technologies and physical science and applications, and also serves as an excellent reference work for researchers and graduate students working on engineering technologies and physical science and applications.

Electric Motors and Drives: Fundamentals, Types and Applications provides information regarding the inner workings of motor and drive system. The book is comprised of nine chapters that cover several aspects and types of motor and drive systems. Chapter 1 discusses electric motors, and Chapter 2 deals with power electronic converters for motor drives. Chapter 3 covers the conventional d.c. motors, while Chapter 4 tackles inductions motors – rotating field, slip, and torque. The book also talks about the operating characteristics of induction motors, and then deals with the inverter-fed induction motor drives. The stepping motor systems; the synchronous, switched reluctance, and brushless d.c. drives; and the motor/drive selection are also covered. The text will be of great use to individuals who wish to familiarize themselves with motor and drive systems.

Control in Power Electronics explores all aspects of the study and use of electronic integrated circuits for the control and conversion of electrical energy. This technology is a critical part of our energy infrastructure, and supports almost all important electrical applications and devices. Improvements in devices and advances in control concepts have led to steady improvements in power electronic applications. This is driving a tremendous expansion of their applications. Control in Power Electronics brings together a team of leading experts as contributors. This is the first book to thoroughly combine control methods and techniques for power electronic systems. The development of new semiconductor power components, new topologies of converters from one side coupled with advances in modern control theory and digital signal processors has made this book possible and presents the applications necessary for modern design engineers. The authors were originally brought together to share research and applications through the international Danfoss Professor Programme at Aalborg University in Denmark. ersonal 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.

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.

Electric machines have a ubiquitous presence in our modern daily lives, from the generators that supply electricity to motors of all sizes that power countless applications. Providing a balanced treatment of the subject, Electric Machines and Drives: Principles, Control, Modeling, and Simulation takes a ground-up approach that emphasizes fundamental principles. The author carefully deploys physical insight, mathematical rigor, and computer simulation to clearly and effectively present electric machines and drive systems. Detailing the fundamental principles that govern electric machines and drives systems, this book: Describes the laws of induction and interaction and demonstrates their fundamental roles with numerous examples Explores dc machines and their principles of operation Discusses a simple dynamic model used to develop speed and torque control strategies Presents modeling, steady state based drives, and high-performance drives for induction machines, highlighting the underlying physics of the machine Includes coverage of modeling and high performance control of permanent magnet synchronous machines Highlights the elements of power electronics used in electric drive systems Examines simulation-based optimal design and numerical simulation of dynamical systems Suitable for a one semester class at the senior undergraduate or a graduate level, the text supplies simulation cases that can be used as a base and can be supplemented through simulation assignments and small projects. It includes end-of-chapter problems designed to pick up on the points presented in chapters and develop them further or introduce additional aspects. The book provides an understanding of the fundamental laws of physics upon which electric machines operate, allowing students to master the mathematical skills that their modeling and analysis requires.

This book is the result of inspirations and contributions from many researchers, a collection of 9 works, which are, in majority, focalised around the Direct Torque Control and may be comprised of three sections: different techniques for the control of asynchronous motors and double feed or double star induction machines, oriented approach of recent developments relating to the control of the Permanent Magnet Synchronous Motors, and special controller design and torque control of switched reluctance machine.

Model Predictive Control of Wind Energy Conversion Systems addresses the predicative control strategy that has emerged as a promising digital control tool within the field of power electronics, variable-speed motor drives, and energy conversion systems. The authors provide a comprehensive analysis on the model predictive control of power converters employed in a wide variety of variable-speed wind energy conversion systems (WECS). The contents of this book includes an overview of wind energy system configurations, power converters for variable-speed WECS, digital control techniques, MPC, modeling of power converters and wind generators for MPC design. Other topics include the mapping of continuous-time models to discrete-time models by various exact, approximate, and quasi-exact discretization

methods, modeling and control of wind turbine grid-side two-level and multilevel voltage source converters. The authors also focus on the MPC of several power converter configurations for full variable-speed permanent magnet synchronous generator based WECS, squirrel-cage induction generator based WECS, and semi-variable-speed doubly fed induction generator based WECS. Furthermore, this book: Analyzes a wide variety of practical WECS, illustrating important concepts with case studies, simulations, and experimental results Provides a step-by-step design procedure for the development of predictive control schemes for various WECS configurations Describes continuous- and discrete-time modeling of wind generators and power converters, weighting factor selection, discretization methods, and extrapolation techniques Presents useful material for other power electronic applications such as variable-speed motor drives, power quality conditioners, electric vehicles, photovoltaic energy systems, distributed generation, and high-voltage direct current transmission. Explores S-Function Builder programming in MATLAB environment to implement various MPC strategies through the companion website Reflecting the latest technologies in the field, Model Predictive Control of Wind Energy Conversion Systems is a valuable reference for academic researchers, practicing engineers, and other professionals. It can also be used as a textbook for graduate-level and advanced undergraduate courses.

Control of Permanent Magnet Synchronous Motors
High Performance AC Drives
Electric Machines and Drives
Design, Analysis and Application
Torque Control
Principles, Control, Modeling, and Simulation
High-Power Converters and AC Drives
Induction Motors
High Performance Control of AC Drives with Matlab / Simulink Models
Modelling and Control of Switched Reluctance Machines

Permanent magnet synchronous (PMS) motors stand at the forefront of electric motor development due to their energy saving capabilities and performance potential. The motors have been developed in response to mounting environmental crises and growing electricity prices, and they have enabled the emergence of motor drive applications like those found in electric and hybrid vehicles, fly by wire, and drones. Control of Permanent Magnet Synchronous Motors is a timely advancement along that path as the first comprehensive, self-contained, and thoroughly up-to-date book devoted solely to the control of PMS motors. It offers a deep and extended analysis, design, implementation, and performance evaluation of major motor control methods, including Vector, Direct Torque, Predictive, Deadbeat, and Combined Control, in a systematic and coherent manner. All major Sensorless Control and Parameter Estimation methods are also studied. The book places great emphasis on energy saving control schemes.

Wearable Robotics: Systems and Applications provides a comprehensive overview of the entire field of wearable robotics, including active orthotics (exoskeleton) and active prosthetics for the upper and lower limb and full body. In its two major sections, wearable robotics systems are described from both engineering perspectives and their application in medicine and industry. Systems and applications at various levels of the development cycle are presented, including those that are still under active research and development, systems that are under preliminary or full clinical trials, and those in commercialized products. This book is a great resource for anyone working in this field, including researchers, industry professionals and those who want to use it as a teaching mechanism. Provides a comprehensive overview of the entire field, with both engineering and medical perspectives Helps readers quickly and efficiently design and develop wearable robotics for healthcare applications
An essential reference to the modeling techniques of wind turbine systems for the application of advanced control methods This book covers the modeling of wind power and application of modern control methods to the wind power control—specifically the models of type 3 and type 4 wind turbines. The modeling aspects will help readers to streamline the wind turbine and wind power plant modeling, and reduce the burden of power system simulations to investigate the impact of wind power on power systems. The use of modern control methods will help technology development, especially from the perspective of manufactures. Chapter coverage includes: status of wind power development, grid code requirements for wind power integration; modeling and control of doubly fed induction generator (DFIG) wind turbine generator (WTG); optimal control strategy for load reduction of full scale converter (FSC) WTG; clustering based WTG model linearization; adaptive control of wind turbines for maximum power point tracking (MPPT); distributed model predictive active power control of wind power plants and energy storage systems; model predictive voltage control of wind power plants; control of wind power plant clusters; and fault ride-through capability enhancement of VSC HVDC connected offshore wind power plants. Modeling and Modern Control of Wind Power also features tables, illustrations, case studies, and an appendix showing a selection of typical test systems and the code of adaptive and distributed model predictive control. Analyzes the developments in control methods for wind turbines (focusing on type 3 and type 4 wind turbines) Provides an overview of the latest changes in grid code requirements for wind power integration Reviews the operation characteristics of the FSC and DFIG WTG Presents production efficiency improvement of WTG under uncertainties and disturbances with adaptive

control Deals with model predictive active and reactive power control of wind power plants Describes enhanced control of VSC HVDC connected offshore wind power plants Modeling and Modern Control of Wind Power is ideal for PhD students and researchers studying the field, but is also highly beneficial to engineers and transmission system operators (TSOs), wind turbine manufacturers, and consulting companies.
The modern world hungers for electricity. Traditionally, this hunger was sated with predominantly constant-speed-regulated, synchronous generators. However, new demands require the stable, quick, and efficient delivery and control offered by variable-speed generators. Surveying all of the technologies used to satisfy the world's demand for o
Electric drives are everywhere, and with the looming promise of electric vehicles and renewable energy, they will become more complex and the demands on their capabilities will continue to increase. To keep up with these trends, students require hands-on knowledge and a keen understanding of the subtleties involved in the operation of modern electric drives. The best-selling first edition of Electric Drives provided such an understanding, and this Second Edition offers the same approach with up-to-date coverage of all major types of electric drives, both constant and variable speed. This book provides a self-contained treatment of low-, medium-, and large-power drives illustrated by numerous application examples, problems, digital simulation results, and test results for both steady state and dynamic operation. This edition features updated material in every chapter, including references; new material on AC brush series motors, capacitor-split inductor motors, single-phase PMSMs and switched reluctance motors, and tooth-wound PMSMs, all with numerical examples; new case studies on AC synchronous and induction motors; and a new chapter on control of electric generators. The companion CD-ROM features the full text, class slides for instructors, and MATLAB® simulations of 10 closed-loop drives, two of which are new to this edition. With a practical, hands-on approach, Electric Drives, Second Edition is the ideal textbook to help students design, simulate, build, and test modern electric drives, from simple to complex.
This book deals with the design and analysis of Direct Torque Control (DTC). It introduces readers to two major applications of electrical machines: speed drive and position control and gives the readers a comprehensive overview of the field of DTC dedicated to AC machines. It includes new DTC approaches with and without control of commutation frequency. It also covers DTC applications using artificial intelligence. The book combines theoretical analysis,

simulation, and experimental concepts.To make the content as accessible as possible, the book employs a clear proposal in each chapter, moving from the background, to numerical development, and finally to case studies and illustrations. The book is a wide-ranging reference source for graduate students, researchers, and professors from related fields and it will benefit practicing engineers and experts from the industry.

Fault Diagnosis and Prognosis Techniques for Complex Engineering Systems gives a systematic description of the many facets of envisaging, designing, implementing, and experimentally exploring emerging trends in fault diagnosis and failure prognosis in mechanical, electrical, hydraulic and biomedical systems. The book is devoted to the development of mathematical methodologies for fault diagnosis and isolation, fault tolerant control, and failure prognosis problems of engineering systems. Sections present new techniques in reliability modeling, reliability analysis, reliability design, fault and failure detection, signal processing, and fault tolerant control of engineering systems. Sections focus on the development of mathematical methodologies for diagnosis and prognosis of faults or failures, providing a unified platform for understanding and applicability of advanced diagnosis and prognosis methodologies for improving reliability purposes in both theory and practice, such as vehicles, manufacturing systems, circuits, flights, biomedical systems. This book will be a valuable resource for different groups of readers – mechanical engineers working on vehicle systems, electrical engineers working on rotary machinery systems, control engineers working on fault detection systems, mathematicians and physician working on complex dynamics, and many more. Presents recent advances of theory, technological aspects, and applications of advanced diagnosis and prognosis methodologies in engineering applications Provides a series of the latest results, including fault detection, isolation, fault tolerant control, failure prognosis of components, and more Gives numerical and simulation results in each chapter to reflect engineering practices

Deadbeat Direct Torque Control of Induction Machines Using Self-sensing at Low and Zero Speed
IAENG Transactions on Engineering Technologies
Applications, Control and Fault Diagnostics
Electric Drives, Second Edition
Electric Motors and Drives
Permanent Magnet Synchronous and Brushless DC Motor Drives
Selected Problems

Direct Torque Control Strategies of Electrical Machines
Robust Kalman Filtering for Signals and Systems with Large Uncertainties
Electric Vehicle Machines and Drives

A significant shortcoming of the state space control theory that emerged in the 1960s was its lack of concern for the issue of robustness. However, in the design of feedback control systems, robustness is a critical issue. These facts led to great activity in the research area of robust control theory. One of the major developments of modern control theory was the Kalman Filter and hence the development of a robust version of the Kalman Filter has become an active area of research. Although the issue of robustness in filtering is not as critical as in feedback control (where there is always the issue of instability to worry about), research on robust filtering and state estimation has remained very active in recent years. However, although numerous books have appeared on the topic of Kalman filtering, this book is one of the first to appear on robust Kalman filtering. Most of the material presented in this book derives from a period of research collaboration between the authors from 1992 to 1994. However, its origins go back earlier than that. The first author (LR. P.) became in terested in problems of robust filtering through his research collaboration with Dr. Duncan McFarlane. At this time, Dr. McFarlane was employed at the Melbourne Research Laboratories ofBHP Ltd. , a large Australian min erals, resources, and steel processing company.

A comprehensive reference of the latest developments in MV drive technology in the area of power converter topologies This new edition reflects the recent technological advancements in the MV drive industry, such as advanced multilevel converters and drive configurations. It includes three new chapters, Control of Synchronous Motor Drives, Transformerless MV Drives, and Matrix Converter Fed Drives. In addition, there are extensively revised chapters on Multilevel Voltage Source Inverters and Voltage Source Inverter-Fed Drives. This book includes a systematic analysis on a variety of high-power multilevel converters, illustrates important concepts with simulations and experiments, introduces various megawatt drives produced by world leading drive manufacturers, and addresses practical problems and their mitigations methods. This new edition: Provides an in-depth discussion and analysis of various control schemes for the MV synchronous motor drives Examines new technologies developed to eliminate the isolation transformer in the MV drives Discusses the operating principle and modulation schemes of matrix converter (MC) topology and multi-module cascaded matrix converters (CMCs) for MV drives, and their application in commercial MV drives Bin Wu is a Professor and Senior NSERC/Rockwell Automation Industrial Research Chair in Power Electronics and Electric Drives at Ryerson University, Canada. He is a fellow of Institute of Electrical and Electronics Engineers (IEEE), Engineering Institute of Canada (EIC), and Canadian Academy of

Engineering (CAE). Dr. Wu has published more than 400 papers and holds more than 30 granted/pending US/European patents. He co-authored several books including Power Conversion and Control of Wind Energy Systems and Model Predictive Control of Wind Energy Conversion Systems (both by Wiley-IEEE Press). Mehdi Narimani is a Postdoctoral Research Associate with the Department of Electrical and computer Engineering at Ryerson University, Canada, and Rockwell Automation Canada. He is a senior member of IEEE. Dr. Narimani is author/co-author of more than 50 technical papers and four US/European patents (issued/pending review). His current research interests include power conversion, high power converters, control of power electronics, and renewable energy systems.

Information technology and its convergence issue is emerging rapidly as an exciting new paradigm with user-centric environment to provide computing and communication services. This area will be the most comprehensive topics with various aspects of advances in information technology and its convergence services. This book covers all topics as computational science and applications, electronics engineering, manufacturing technology, services, technical skill to control the robot, automatic operation and application, simulation and testing communication and many more.

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

Alternating current (AC) induction and synchronous machines are frequently used in variable speed drives with applications ranging from computer peripherals, robotics, and machine tools to railway traction, ship propulsion, and rolling mills. The notable impact of vector control of AC drives on most traditional and new technologies, the multitude of practical configurations proposed, and the absence of books treating this subject as a whole with a unified approach were the driving forces behind the creation of this book. Vector Control of AC Drives examines the remarkable progress achieved worldwide in vector control from its introduction in 1969 to the current technology. The book unifies the treatment of vector control of induction and synchronous motor drives using the concepts of general flux orientation and the feed-forward (indirect) and feedback (direct) voltage and current vector control. The concept of torque vector control is also introduced and applied to all AC motors. AC models for drive applications developed in complex variables (space phasors), both for induction and synchronous motors, are used throughout

the book. Numerous practical implementations of vector control are described in considerable detail, followed by representative digital simulations and test results taken from the recent literature. Vector Control of AC Drives will be a welcome addition to the reference collections of electrical and mechanical engineers involved with machine and system design.

Variable speed is one of the important requirements in most of the electric drives. Earlier dc motors were the only drives that were used in industries requiring - eration over a wide range of speed with step less variation, or requiring fine ac- racy of speed control. Such drives are known as high performance drives. AC - tors because of being highly coupled non-linear devices can not provide fast dynamic response with normal controls. However, recently, because of ready availability of power electronic devices, and digital signal processors ac motors are beginning to be used for high performance drives. Field oriented control or vector control has made a fundamental change with regard to dynamic perfo- ance of ac machines. Vector control makes it possible to control induction or s- chronous motor in a manner similar to control scheme used for the separately - cited dc motor. Recent advances in artificial intelligence techniques have also contributed in the improvement in performance of electric drives. This book presents a comprehensive view of high performance ac drives. It may be considered as both a text book for graduate students and as an up-to-date monograph. It may also be used by R & D professionals involved in the impro- ment of performance of drives in the industries. The book will also be beneficial to the researchers pursuing work on sensorless and direct torque control of electric drives as up-to date references in these topics are provided. Despite two decades of massive strides in research and development on control strategies and their subsequent implementation, most books on permanent magnet motor drives still focus primarily on motor design, providing only elementary coverage of control and converters. Addressing that gap with information that has largely been disseminated only in journals and at conferences, Permanent Magnet Synchronous and Brushless DC Motor Drives is a long-awaited comprehensive overview of power electronic converters for permanent magnet synchronous machines and control strategies for variable-speed operation. It introduces machines, power devices, inverters, and control, and addresses modeling, implementation, control strategies, and flux weakening operations, as well as parameter sensitivity, and rotor position sensorless control. Suitable for both industrial and academic audiences, this book also covers the simulation, low cost inverter topologies, and commutation torque ripple of PM brushless DC motor drives. Simulation of the motor drives system is illustrated with MATLAB® codes in the text. This book is divided into three parts—fundamentals of PM synchronous and brushless dc machines, power devices, inverters; PM synchronous motor drives, and brushless dc motor drives. With regard to the power electronics associated with

these drive systems, the author: Explores use of the standard three-phase bridge inverter for driving the machine, power factor correction, and inverter control Introduces space vector modulation step by step and contrasts with PWM Details dead time effects in the inverter, and its compensation Discusses new power converter topologies being considered for low-cost drive systems in PM brushless DC motor drives This reference is dedicated exclusively to PM ac machines, with a timely emphasis on control and standard, and low-cost converter topologies. Widely used for teaching at the doctoral level and for industrial audiences both in the U.S. and abroad, it will be a welcome addition to any engineer's library.

Control in Power Electronics
Deadbeat Direct Torque & Flux Control for Interior Permanent Magnet Synchronous Machines
Information Technology Convergence
Vector Control of AC Drives
Fundamentals, types and applications
The Electric Generators Handbook - 2 Volume Set
Multidisciplinary Design Optimization Methods for Electrical Machines and Drive Systems
Security, Robotics, Automations and Communication
Systems and Applications
Wearable Robotics

Electrical machines are used in the process of energy conversion in the generation, transmission and consumption of electric power. In addition to this, electrical machines are considered the main part of electrical drive systems. Electrical machines are the subject of advanced research. In the development of an electrical machine, the design of its different structures is very important. This design ensures the robustness, energy efficiency, optimal cost and high reliability of the system. Using advanced techniques of control and new technology products has brought electrical machines into their optimal functioning mode. Different techniques of control can be applied depending on the goals considered. The aim of this book is to present recent work on the design, control and applications of electrical machines.

Motivated by the need of energy-efficiency improvements, process optimization, soft-start capability and numerous other environmental benefits, it may be desirable to operate induction motors for many applications at continuously adjustable speeds. The induction motor drives can provide high productivity with energy efficiency in different industrial applications and are the basis for modern automation. This book provides an account of this developing subject through such topics as modelling, noise, control techniques used for high-performance applications and diagnostics. Compiled from contributions by international

researchers, this is not a textbook, but the result is an interesting exploration of this technology, that provides a combination of theory, implementation issues and practical examples.

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 it. Model Predictive Control of High Power Converters and Industrial Drives will enable to 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.

The book presents the latest power conversion and control technology in modern wind energy systems. It has nine chapters, covering technology overview and market survey, electric generators and modeling, power converters and modulation techniques, wind turbine characteristics and configurations, and control schemes for fixed- and variable-speed wind energy systems. The book also provides in-depth steady-state and dynamic analysis of squirrel cage induction generator, doubly fed induction generator, and synchronous generator based wind energy systems. To illustrate the key concepts and help the reader tackle real-world issues, the book contains more than 30 case studies and 100 solved problems in addition to simulations and experiments. The book serves as a comprehensive reference for academic researchers and practicing engineers. It can also be used as a textbook for graduate students and final year undergraduate students.

Today, switched reluctance machines (SRMs) play an increasingly important role in various sectors due to advantages such as robustness, simplicity of construction, low cost, insensitivity to high temperatures, and high fault tolerance. They are frequently used in fields such as aeronautics, electric and hybrid vehicles, and wind power generation. This book is a comprehensive resource on the design, modeling, and control of SRMs with methods that demonstrate their good performance as motors and generators.

Electric motors are widely used in industries to convert electrical energy into mechanical form. Control techniques are designed to improve the performance and efficiency of the drive so that large amounts of electrical energy can be saved. This book is primarily written with the objective of providing necessary information on use of electric motors for various applications in industries. During the last ten years a number of methods of control of electric drives have emerged. Some of these methods are described in this book. The reader will be able to understand the new methods of control used in drives, e.g. direct and sensorless control. Also the application of motor control in dentistry, the effect of human reaction and improvement of the efficiency of drives with control have been described.

As the demand for efficient energy sources continues to grow around the globe, electrical systems are becoming more essential in an effort to meet these increased needs. As these systems are being utilized more frequently, it becomes imperative to find ways of optimizing their overall function. The Handbook of Research on Emerging Technologies for Electrical Power Planning, Analysis, and Optimization features emergent methods and research in the systemic and strategic planning of energy usage. Highlighting theoretical perspectives and empirical research, this handbook is a comprehensive reference source for researchers, practitioners, students, and professionals interested in the current advancements and efficient use in power systems.

Power Conversion and Control of Wind Energy Systems
Handbook of Research on Emerging Technologies for Electrical Power Planning, Analysis, and Optimization
Variable Speed Generators
8th International Workshop, HSCC 2005, Zurich, Switzerland, March 9-11, 2005, Proceedings
Special Volume of the World Congress on Engineering 2012
Simulations and Laboratory Implementation
Model Predictive Control of High Power Converters and Industrial Drives
Advanced Direct Thrust Force Control of Linear Permanent Magnet Synchronous Motor
Fault Diagnosis and Prognosis Techniques for Complex Engineering Systems
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