

Sensorless Control of AC Motor Drives

Speed and Position Sensorless Operation

Edited by

Kaushik Rajashekara

Atsuo Kawamura

Kouki Matsuse



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Sensorless Control Of Ac Motor Drives Speed And Position Sensorless Operation

Hamid A. Toliyat, Gerald B. Kliman



Sensorless Control Of Ac Motor Drives Speed And Position Sensorless Operation:

Sensorless Control of AC Motor Drives Kaushik Rajashekara, Atsuo Kawamura, Kouki Matsuse, 1996 Inhalt The purpose of this book is to review the various schemes and methodologies used for speed sensorless operation of induction motors and position sensorless operation of permanent magnet synchronous reluctance and switched reluctance motors Various sensorless control strategies are reviewed based on the papers published in IEEE transactions and conferences and in other international journals

Control in Power Electronics Marian P. Kazmierkowski, Ramu Krishnan, Frede Blaabjerg, 2002-08-20 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 Personal computers would be unwieldy and inefficient without power electronic dc supplies Portable communication devices and computers would also be impractical High performance lighting systems motor controls and a wide range of industrial controls depend on power electronics In the near future we can expect strong growth in automotive applications dc power supplies for communication systems portable applications and high end converters We are approaching a time when all electrical energy will be processed and controlled through power electronics somewhere in the path from generation to end use

Vector Control of Three-Phase AC Machines Nguyen Phung Quang, Jörg-Andreas Dittrich, 2015-05-14 This book addresses the vector control of three phase AC machines in particular induction motors with squirrel cage rotors IM permanent magnet synchronous motors PMSM and doubly fed induction machines DFIM from a practical design and development perspective The main focus is on the application of IM and PMSM in electrical drive systems where field orientated control has been successfully established in practice It also discusses the use of grid voltage oriented control of DFIMs in wind power plants This second enlarged edition includes new insights into flatness based nonlinear control of IM PMSM and DFIM The book is useful for practitioners as well as development engineers and designers in the area of electrical drives and wind power technology It is a valuable resource for researchers and students

Handbook of Fractional-Horsepower Drives Hans-Dieter Stoelting, Eberhard Kallenbach, Wolfgang Amrhein, 2008-04-29 Aimed at engineers in product development as well as advanced students of electrical engineering control and mechatronics

this is the first English language edition of the bestselling German book in which the authors address the issue of fractional horsepower drives They are crucial for all kinds of products from simple domestic utensils to the most complex and advanced technological applications This handbook gives a practical overview on all of the available drives High Performance Control of AC Drives with Matlab / Simulink Models Haitham Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, 2012-04-13 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

Instrument Engineers' Handbook, Volume Two Bela G. Liptak, 2018-10-08 The latest update to Bela Liptak's acclaimed bible of instrument engineering is now available Retaining the format that made the previous editions bestsellers in their own right the fourth edition of Process Control and Optimization continues the tradition of providing quick and easy access to highly practical information The authors are practicing engineers not theoretical people from academia and their from the trenches advice has been repeatedly tested in real life applications Expanded coverage includes descriptions of overseas manufacturer's products and concepts model based optimization in control theory new major inventions and innovations in control valves and a full chapter devoted to safety With more than 2000 graphs figures and tables this all inclusive encyclopedic volume replaces an entire library with one authoritative reference The fourth edition brings the content of the previous editions completely up to date incorporates the developments of the last decade and broadens the horizons of the work from an American to a global perspective Bela G Liptak speaks on Post Oil Energy Technology on the AT T Tech Channel *AC Electric Motors Control* Fouad Giri, 2013-03-25 The complexity of AC motor control lies in the

multivariable and nonlinear nature of AC machine dynamics Recent advancements in control theory now make it possible to deal with long standing problems in AC motors control This text expertly draws on these developments to apply a wide range of model based control design methods to a variety of AC motors Contributions from over thirty top researchers explain how modern control design methods can be used to achieve tight speed regulation optimal energetic efficiency and operation reliability and safety by considering online state variable estimation in the absence of mechanical sensors power factor correction machine flux optimization fault detection and isolation and fault tolerant control Describing the complete control approach both controller and observer designs are demonstrated using advanced nonlinear methods stability and performance are analysed using powerful techniques including implementation considerations using digital computing means Other key features Covers the main types of AC motors including triphase multiphase and doubly fed induction motors wound rotor permanent magnet and interior PM synchronous motors Illustrates the usefulness of the advanced control methods via industrial applications including electric vehicles high speed trains steel mills and more Includes special focus on sensorless nonlinear observers adaptive and robust nonlinear controllers output feedback controllers fault detection and isolation algorithms and fault tolerant controllers This comprehensive volume provides researchers and designers and R D engineers with a single source reference on AC motor system drives in the automotive and transportation industry It will also appeal to advanced students in automatic control electrical power systems mechanical engineering and robotics as well as mechatronic process and applied control system engineers

Induction Motor Control Design Riccardo Marino, Patrizio Tomei, Cristiano M. Verrelli, 2010-08-20 This book provides the most important steps and concerns in the design of estimation and control algorithms for induction motors A single notation and modern nonlinear control terminology is used to make the book accessible although a more theoretical control viewpoint is also given Focusing on the induction motor with the concepts of stability and nonlinear control theory given in appendices this book covers speed sensorless control design of adaptive observers and parameter estimators a discussion of nonlinear adaptive controls containing parameter estimation algorithms and comparative simulations of different control algorithms The book sets out basic assumptions structural properties modelling state feedback control and estimation algorithms then moves to more complex output feedback control algorithms based on stator current measurements and modelling for speed sensorless control The induction motor exhibits many typical and unavoidable nonlinear features

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>.

Analysis of Electric Machinery and Drive Systems Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven D. Pekarek, 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.

Operation, Construction, and Functionality of Direct Current Machines Amin, Muhammad, Rehmani, Mubashir Husain, 2015-04-30. Direct current machines are a quickly evolving domain whose applications affect many aspects of modern

life from computers and printers to toys electric vehicles and traction applications As their many uses continue to grow it has become apparent that understanding these machines is the key to understanding our future Operation Construction and Functionality of Direct Current Machines brings together many concepts from the most basic working principles and construction of DC machines to more advanced topics such as electro magnetism armature reaction parallel operations and many more Highlighting theoretical concepts and numerical problems this book is an essential reference source for students educators and anyone interested in the field of electric machines

Current Trends in Nonlinear Systems and Control

Laura Menini, Luca Zaccarian, Chaouki T. Abdallah, 2006-09-13 This volume is an outgrowth of the workshop Applications of Advanced Control Theory to Robotics and Automation organized in honor of the 70th birthdays of Petar V Kokotovic and Salvatore Turi Nicosia Both Petar and Turi have carried out distinguished work in the control community and have long been recognized as mentors as well as experts and pioneers in the field of automatic control covering many topics in control theory and several different applications The variety of their research is reflected in this book which includes contributions ranging from mathematics to laboratory experiments The scope of the work is very broad and although each chapter is self contained the book has been organized into thematically related chapters which in some cases suggest to the reader a convenient reading sequence The great variety of topics covered and the almost tutorial writing style used by many of the authors will make this book suitable for both experts in the control field and young researchers who seek a more intuitive understanding of these relevant topics in the field

High Performance Control of AC Drives with Matlab/Simulink

Haitham Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, 2021-04-06 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

Proceedings of the Tenth International Symposium on Applied Electromagnetic and Mechanics T. Takagi, 2003 This publication covers topics in the area of applied electromagnetics and mechanics Since starting in Japan in 1988 the ISEM has become a well known international forum on applied electromagnetics

Electric Drives Ion Boldea, Syed A. Nasar, 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

The Customer Satisfaction towards Service Quality of Electrical Equipments E. Sankaran, Dr. K S Meenakshi Sundaram, Dr. D Kirubakaran, *Permanent Magnet Synchronous Machines* Sandra Eriksson, 2019-08-20 Interest in permanent magnet synchronous machines PMSMs is continuously increasing worldwide especially with the increased use of renewable energy and the electrification of transports This book contains the successful submissions of fifteen papers to a Special Issue of Energies on the subject area of Permanent Magnet Synchronous Machines The focus is on permanent magnet synchronous machines and the electrical systems they are connected to The presented work represents a wide range of areas Studies of control systems both for permanent magnet synchronous machines and for brushless DC motors are presented and experimentally verified Design studies of generators for wind power wave power and hydro power are presented Finite element method simulations and analytical design methods are used The presented studies represent several of the different research fields on permanent magnet machines and electric drives

Handbook of Electric Motors Hamid A. Toliyat, Gerald B. Kliman, 2018-10-03 Presenting current issues in electric motor design installation application and performance this second edition serves as the most authoritative and reliable guide to electric motor utilization and assessment in the commercial and industrial sectors Covering topics ranging from motor energy and efficiency to computer aided design and equipment selection this reference assists professionals in all aspects of electric motor

maintenance repair and optimization It has been expanded by more than 40 percent to explore the most influential technologies in the field including electronic controls superconducting generators recent analytical tools new computing capabilities and special purpose motors **Soft Computing in Industrial Electronics** Seppo J. Ovaska, Les M. Sztandera, 2013-06-05 It is expected that the use of soft computing will increase greatly in industrial applications because the conceptual structure of hard computing is much too precise in relation to the great imprecision of the world around us This book aims at attracting researchers and engineers both in the fields of industrial electronics IE and computational intelligence CI By approaching the different viewpoints of IE and CI people it is hoped to provide practicing engineers with new solutions to the demanding real world problems The applications are divided into two categories Electric Power Applications and Emerging Applications Control of Permanent Magnet Synchronous Motors Sadegh Vaez-Zadeh, 2018 Permanent magnet synchronous PMS motors stand at the forefront of electric motor development due to their energy saving capabilities and performance potential This book 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

Sensorless Control Of Ac Motor Drives Speed And Position Sensorless Operation Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has be more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Sensorless Control Of Ac Motor Drives Speed And Position Sensorless Operation**," written by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we will delve to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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