Sensorless Speed Estimation of an Induction Motor

Erik Ringøen 1998

Sensorless Speed Estimation of an Induction Motor

Kien Fatt Wong 2006

Sensorless Speed Estimation of an AC Induction Motor by Using an Artificial Neural Network Approach

Abdulelah Ali Alkhoraiif 2015

Sensorless Speed Estimation of an Induction Motor

Robiah Ahmad 2007

Flux and Speed Estimation Techniques for Sensorless Control of Induction Motors

Mihai Comanescu 2005

Abstract: The focus of this research is the development of novel techniques for estimation and control of sensorless induction motor drives. In a sensorless drive, the speed must be estimated from the system measurements. Depending on the objective of the control (speed or torque control), the speed estimate must be used in one or more areas of the control scheme. This idea and the main techniques for speed estimation are explored. The dissertation investigates the issues related to low-speed flux estimation when a Voltage Model observer is used. Pure integration cannot be implemented due to offsets in the measured signals and integrators must be replaced by low pass filters. At low speed, the...
flux estimates are incorrect in both magnitude and angle; consequently, the rotor position obtained by the DFO method is incorrect. An improved Voltage Model observer that corrects the errors is developed based on a Programmable Low Pass Filter and a vector rotator. The method requires estimation of the stator frequency and this is done by a Phase Locked Loop synchronized with the voltage vector. The traditional rotor flux MRAS method can be used for speed estimation, however, under non-ideal integration the dynamics of the speed estimate exhibits right-hand side plane zeros. Additionally, system tuning is difficult and may yield under damped responses. Two novel Sliding Mode MRAS observers are designed and implemented and their features are used for speed estimation. The d-q rotational frame currents of an induction machine are not decoupled. Decoupling can be achieved by canceling the cross-coupled terms in the equations of the synchronous frame currents. This approach is both inconvenient and inaccurate. A novel approach for decoupling is presented: an Integral Sliding Mode controller complements a traditional controller that acts on a simulated plant. The use of the Integral SM controller guarantees that the currents in the real plant will track those of the simulated model. The additional controller compensates for the cross-terms and for variations of the machine parameters. The method is also valuable for allowing fast and efficient tuning of the current controllers.

**The Field Orientation Principle in Control of Induction Motors**-Andrzej M. Trzynadlowski 2013-11-27 The Field Orientation Principle was first formulated by Haase, in 1968, and Blaschke, in 1970. At that time, their ideas seemed impractical because of the insufficient means of implementation. However, in the early eighties, technological advances in static power converters and microprocessor-based control systems made the high-performance a. c. drive systems fully feasible. Since then, hundreds of papers dealing with various aspects of the Field Orientation Principle have appeared every year in the technical literature, and numerous commercial high-performance a. c. drives based on this principle have been developed. The term “vector control” is often used with regard to these systems. Today, it seems certain that almost all d. c. industrial drives will be ousted by a. c. drive systems with vector controlled induction motors. This transition has already been taking place in industries of developed countries. Vector controlled a. c. drives have been proven capable of even better dynamic performance than d. c. drive systems, because of higher allowable speeds and shorter time constants of a. c. motors. It should be mentioned that the Field Orientation Principle can be used in control not only of induction (asynchronous) motors, but of all kinds of synchronous motors as well. Vector controlled drive systems with the so called brushless d. c. motors have found many applications in high performance drive systems, such as machine tools and industrial robots.

**Sensorless Speed Estimation in Wound Rotor Induction Machines Drives**-Kavul Tshiloz 2016

**AETA 2013: Recent Advances in Electrical Engineering and Related Sciences**-Ivan Zelinka 2013-11-01 Over the past decades, fault diagnosis (FDI) and fault tolerant control strategies (FTC) have been proposed based on different techniques for linear and nonlinear systems. Indeed a considerable attention is deployed in order to cope with diverse damages resulting in faults occurrence.

**Motor speed estimation with sensorless vectorial control, employing an extended kalman filter with estimation of the covariance of the noises**- 2004 Este trabalho apresenta uma solução para a estimação da velocidade do motor de indução quando é aplicado um controle vetorial sem sensor sensorless, utilizando o filtro estendido de Kalman com um filtro secundário, inovador, que proporciona os valores ótimos das matrizes de covariância e pode trabalhar em forma on-line.

**SPEED ESTIMATION TECHNIQUES FOR SENSORLESS VECTOR CONTROLLED INDUCTION MOTOR DRIVE.**- 2005 This work focuses on speed estimation techniques for sensorless closed-loop speed control of an induction machine based on direct field-oriented control technique. Details of theories behind the algorithms are stated and their performances are verified by the help of simulations and
experiments. The field-oriented control as the vector control technique is mainly implemented in two ways: indirect field oriented control and direct field oriented control. The field to be oriented may be rotor, stator, or airgap flux-linkage. In the indirect field-oriented control no flux estimation exists. The angular slip velocity estimation based on the measured or estimated rotor speed is required, to compute the synchronous speed of the motor. In the direct field oriented control the synchronous speed is computed with the aid of a flux estimator. Field Oriented Control is based on projections which transform a three phase time and speed dependent system into a two co-ordinate time invariant system. These projections lead to a structure similar to that of a DC machine control. The flux observer used has an adaptive structure which makes use of both the voltage model and the current model of the machine. The rotor speed is estimated via Kalman filter technique which has a recursive state estimation feature. The flux angle estimated by flux observer is processed taking the angular slip velocity into account for speed estimation. For closed-loop speed control of system, torque, flux and speed producing control loops are tuned by the help of PI regulators. The performance of the closed-loop speed control is investigated by simulations and experiments. TMS320F2812 DSP controller card and the Embedded Target for the TI C2000 DSP tool of Matlab are utilized for the real-time experiments.

Speed-sensorless Estimation and Position Control of Induction Motors for Motion Control Applications-Murat Barut 2006
High performance sensorless position control of induction motors (IMs) calls for estimation and control schemes which offer solutions to parameter uncertainties as well as to difficulties involved with accurate flux and velocity estimation at very low and zero speed. In this thesis, novel control and estimation methods have been developed to address these challenges. The proposed estimation algorithms are designed to minimize estimation error in both transient and steady-state over a wide velocity range, including very low and persistent zero speed operation. To this aim, initially single Extended Kalman Filter (EKF) algorithms are designed to estimate the flux, load torque, and velocity, as well as the rotor, Rr' or stator, Rs resistances. The temperature and frequency related variations of these parameters are well-known challenges in the estimation and control of IMs, and are subject to ongoing research. To further improve estimation and control performance in this thesis, a novel EKF approach is also developed which can achieve the simultaneous estimation of Rr' and Rs for the first time in the sensorless IM control literature. The so-called Switching and Braided EKF algorithms are tested through experiments conducted under challenging parameter variations over a wide speed range, including under persistent operation at zero speed. Finally, in this thesis, a sensorless position control method is also designed using a new sliding mode controller (SMC) with reduced chattering. The results obtained with the proposed control and estimation schemes appear to be very compatible and many times superior to existing literature results for sensorless control of IMs in the very low and zero speed range. The developed estimation and control schemes could also be used with a variety of the sensorless speed and position control applications, which are challenged by a high number of parameter uncertainties.

Adaptive State Filtering with Neural Networks for Sensorless Induction Motor
Speed Estimation-Raj Mohan Bharadwaj 2000

Investigation of Sensorless Flux and Speed Estimation for Direct Torque Control of PMSM- 2000

Study and Application for Rotational Speed Estimation Method of a Sensorless Dc Motor Using Adaptive Filter- 2010


SENSORLESS DIRECT FIELD ORIENTED CONTROL OF INDUCTION MACHINE BY FLUX AND SPEED ESTIMATION USING MODEL REFERENCE ADAPTIVE SYSTEM.- 2004 ABSTRACT SENSORLESS DIRECT FIELD ORIENTED CONTROL OF INDUCTION MACHINE BY FLUX AND SPEED ESTIMATORS USING MODEL REFERENCE ADAPTIVE SYSTEM This work focuses on an observer
design which will estimate flux-linkage and speed for induction motors in its entire speed control range. The theoretical base of the algorithm is explained in detail and its both open-loop, and closed-loop performance is tested with experiments, measuring only stator current and voltage. Theoretically, the field-oriented control for the induction motor drive can be mainly categorized into two types.

**High Performance Sensorless Induction Motor Drive**-Jogendra Singh Thongam 2010-08

Sensors, widely used in electric drives, degrade the system reliability and require special attention to electrical noise in addition to extra expenses involved. Further, drive performance is affected by unknown rotor resistance variation which causes incorrect decoupling of flux and torque currents leading to deterioration of its performance. This book focusses on the development of high performance sensorless induction motor drive. Sensorless vector control is realized by developing rotor flux and speed estimation algorithms using only the measurable stator terminal quantities: the current and voltage. Whereas, in another approach, sensorless control is realized by developing simultaneous speed and rotor resistance estimation algorithm without requiring any external signal injection. Reduced order observers are used for implementing estimation algorithms to reduce computational burden. This work can be a good resource and reference for researchers and graduate students interested in the area of sensorless induction motor drive and control theory applications. The work will also be useful to undergraduate students wishing to have an overall idea of induction motor drive control.

**Transactions on Engineering Technologies**-Sio-Iong Ao 2017-02-04

This proceedings volume contains selected revised and extended research articles written by researchers who participated in the World Congress on Engineering and Computer Science 2015, held in San Francisco, USA, 21-23 October 2015. Topics covered include engineering mathematics, electrical engineering, circuits, communications systems, computer science, chemical engineering, systems engineering, manufacturing engineering, and industrial applications. The book offers the reader an overview of the state of the art in engineering technologies, computer science, systems engineering and applications, and will serve as an excellent reference work for researchers and graduate students working in these fields.


The book is a collection of high-quality peer-reviewed research papers presented in International Conference on Soft Computing Systems (ICSCS 2015) held at Noorul Islam Centre for Higher Education, Chennai, India. These research papers provide the latest developments in the emerging areas of Soft Computing in Engineering and Technology. The book is organized in two volumes and discusses a wide variety of industrial, engineering and scientific applications of the emerging techniques. It presents invited papers from the inventors/originators of new applications and advanced technologies.

**On Sensorless Control of Induction Motor Drives**-Ove Glenberg 2010-07

In high-demanding ac drives as for example traction applications, usually, an encoder or speed sensor is needed on the rotor shaft. Replacing this sensor with speed estimation may result in lower costs and maintenance demands due to one less critical component in the system. By estimating the speed instead of measuring it is called sensorless control. The topic in this book is sensorless control adopted on the induction machine (IM). Research in the area sensorless control is wide and especially control problems at low speed has been an interesting problem to solve. In this book the focusing topic is 0 Hz crossover problems, which occurs as the machine alters between motoring and regenerating drive. As sensorless control method a rotor flux estimator is adopted in a vector controlled scheme by the so-called voltage model (VM). The VM design is used for estimating the frequency by measured stator voltages and currents. The analysis here mainly considers parameter variations and instability problems, which are two important reasons for control problems at low speed. The proposed final method shows good performance both by linear and nonlinear analysis methods.

**Modern Electrical Drives**-H. Bülent Ertan 2013-06-29

Electrical drives lie at the heart of most industrial processes and make a major
sensorless-speed-estimation-of-an-induction-motor-in-a

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.

Permanent Magnet Synchronous and Brushless DC Motor Drives-Ramu Krishnan 2017-12-19 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.

Nature-Inspired Computation and Machine Learning-Alexander Gelbukh 2014-11-05 The two-volume set LNAI 8856 and LNAI 8857 constitutes the proceedings of the 13th Mexican International Conference on Artificial Intelligence, MICAI 2014, held in Tuxtla, Mexico, in November 2014. The total of 87 papers plus 1 invited talk presented in these proceedings were carefully reviewed and selected from 348 submissions. The first volume deals with advances in human-inspired computing and its applications. It contains 44 papers structured into seven sections: natural language processing, natural language processing applications, opinion mining, sentiment analysis, and social network applications, computer vision, image processing, logic, reasoning, and multi-agent systems, and intelligent tutoring systems. The second volume deals with advances in nature-inspired computation and machine learning and contains also 44 papers structured into eight sections: genetic and evolutionary algorithms, neural networks, machine learning, machine learning applications to audio and text, data mining, fuzzy logic, robotics, planning, and scheduling, and biomedical applications.

Applied Computer Sciences in Engineering-Juan Carlos Figueroa-García 2019-11-11 This volume constitutes the refereed proceedings of the 6th Workshop on Engineering Applications, WEA 2019, held in Santa Marta, Colombia, in October 2019. The 62 revised full papers and 2 short papers presented in this volume were carefully reviewed and selected from 178 submissions. The papers are organized in the following topical sections: computer science; computational intelligence; bioengineering;
Internet of things; power applications; simulation systems; optimization.

**Smart Intelligent Computing and Applications** - Suresh Chandra Satapathy 2018-11-04 The proceedings covers advanced and multi-disciplinary research on design of smart computing and informatics. The theme of the book broadly focuses on various innovation paradigms in system knowledge, intelligence and sustainability that may be applied to provide realistic solution to varied problems in society, environment and industries. The volume publishes quality work pertaining to the scope of the conference which is extended towards deployment of emerging computational and knowledge transfer approaches, optimizing solutions in varied disciplines of science, technology and healthcare.

**Technological Developments in Education and Automation** - Magued Iskander 2010-01-30 Technological Developments in Education and Automation includes set of rigorously reviewed world-class manuscripts dealing with the increasing role of technology in daily lives including education and industrial automation. Technological Developments in Education and Automation contains papers presented at the International Conference on Industrial Electronics, Technology & Automation and the International Conference on Engineering Education, Instructional Technology, Assessment, and E-learning which were part of the International Joint Conferences on Computer, Information and Systems Sciences and Engineering.


**Sensorless AC Electric Motor Control** - Alain Glumineau 2015-03-16 This monograph shows the reader how to avoid the burdens of sensor cost, reduced internal physical space, and system complexity in the control of AC motors. Many applications fields—electric vehicles, wind- and wave-energy converters and robotics, among them—will benefit. Sensorless AC Electric Motor Control describes the elimination of physical sensors and their replacement with observers, i.e., software sensors. Robustness is introduced to overcome problems associated with the unavoidable imperfection of knowledge of machine parameters—resistance, inertia, and so on—encountered in real systems. The details of a large number of speed- and/or position-sensorless ideas for different types of permanent-magnet synchronous motors and induction motors are presented along with several novel observer designs for electrical machines. Control strategies are developed using high-order, sliding-mode and quasi-continuous-sliding-mode techniques and two types of observer-controller schemes based on backstepping and sliding-mode techniques are described. Experimental results validate the performance of these observer and controller configurations with test trajectories of significance in difficult sensorless-AC-machine problems. Control engineers working with AC motors in a variety of industrial environments will find the space-and-cost-saving ideas detailed in Sensorless AC Electric Motor Control of much interest. Academic researchers and graduate students from electrical, mechanical and control-engineering backgrounds will be able to see how advanced theoretical control can be applied in meaningful real systems.

**Comparison of speed sensorless control techniques applied to induction motors in a dsp platform** - 2003 Este trabalho propõe uma análise comparativa do desempenho de técnicas de controle e estimação de velocidade, com realização discreta no tempo, aplicadas a motores de indução trifásicos, utilizando plataforma com base em um processador digital de sinais de ponto-fixo. Algumas modificações em algoritmos existentes na literatura são propostas para melhorar o desempenho das técnicas em
estudo. Inicialmente, uma revisão histórica sobre a evolução dos sistemas de acionamento para motores de corrente alternada e uma revisão bibliográfica das principais técnicas de estimação de velocidade implementadas em DSP são realizadas. Em seguida, são obtidos diferentes modelos para o motor de indução trifásico representados em referenciais semi-estacionários. A partir do modelo da máquina foram projetados dois controladores de velocidade: um controlador clássico e amplamente utilizado no meio industrial (PI), e, com o objetivo de compensar distúrbios e dinâmicas não modeladas, um controlador adaptativo robusto por modelo de referência (RMRAC) é implementado. Para o projeto de servomecanismos sensorless de alto desempenho, duas técnicas de estimação de velocidade baseadas no modelo do MI foram selecionadas. Uma delas é amplamente difundida no meio acadêmico e industrial, sendo fundamentada em um sistema adaptativo por modelo de referência (MRAS) e outra tem base em um algoritmo de mínimos quadrados recursivos modificados (MRLS) e é apresentada como uma alternativa de alto desempenho. No desenvolvimento deste trabalho, resultados de simulações utilizando o software Matlab®, simulações em tempo-real em plataforma DSP, e por fim, resultados experimentais são apresentados. A partir destes resultados, parte-se para avaliação para determinar quais dos controladores sensorless analisados apresentam resposta dinâmica satisfatória em uma larga faixa de velocidade, inclusive em condições de velocidade baixa e nula, e também diante de situações de variação de carga e de parâmetros.

**T-Source Inverter-Based Sensorless Speed Control for Permanent Magnet Synchronous Motor**

Dineshkumar Selvam 2020

Permanent magnet synchronous motors (PMSM) are used commonly in numerous industrial applications, for instance, in mechatronics, vacuum pumps, energy storage flywheels, automotive, centrifugal compressors, and robotics. Nowadays, the sensorless speed control of PMSM is getting more attention, and several studies are progressing because of its low cost and reliable features. Normally, the speed control methods in PMSM are achieved with the help of sensors for position or speed estimation and control. But, these sensors are easily prone to breakage. Also, the flexibility towards parameter variations is poor in the conventional speed control methods.

So, a sensorless T-source inverter-based PMSM drive that integrates the Proportional Integral (PI) controller with an adaptive mechanism to cope with the time-varying system parameters is proposed in this article. A sensorless module, namely, a model reference adaptive system (MRAS), is employed to estimate the rotor position of PMSM based on its performance characteristics. Simulation results are illustrated to investigate the performance of the proposed method with different speeds under no load and loaded conditions. Moreover, the proposed approach not only minimizes the cost and size of the motor but also maximizes the reliability and accuracy.

**Modeling and Analysis of Four Quadrant Sensorless Control of a Switched Reluctance Machine Over the Entire Speed Range**

Ahmed O. Khalil 2005

"The excitation of the switched reluctance motor (SRM) phases needs to be carefully synchronized with rotor position to obtain an acceptable drive performance. Therefore, rotor position sensing is an integral part of the SRM drives control. Additionally, for precise torque and speed control applications, it is necessary to have rotor position information with reasonably good resolution and high degree of accuracy. Sensorless control methods are an attractive approach in which the rotor position is sensed indirectly without a discrete mechanical position sensor. In the past, several methods have been developed to replace the discrete position sensor. Some of these methods are inductance based while others are flux based. Unfortunately, all of them were confined with the estimation to a limited range of speed and for only one quadrant operation. This dissertation develops a four-quadrant sensorless controller for SRM drives functioning over low and high speeds, including zero speed, with a high resolution position information over the entire speed range. This four-quadrant sensorless controller combines two different methods. At zero and low speeds, a pulse injection position estimation method is used to estimate the rotor position in all four quadrants. At high speeds, a sliding mode observer (SMO) based position and speed estimation is used and combined to work with the low speed algorithm. The transition between the algorithms is smooth and transparent to the inner loop torque controller. The accuracy and resolution of the sensorless controller developed in the research has been enhanced through the use of a novel switched
reluctance (SR) machine model based on the Fourier series expansion that is accurate and invertible. This model, derived from machine geometry and materials properties, is accurate enough to be used for actual machine representation, and can also be simplified for real time sensorless controller application. The model predicts both the inductance and flux linkage accurately for use in various sensorless control algorithms. The experimental tests performed showed accurate position estimation using the new Fourier model. The error analysis performed in this research demonstrated the superiority of the Fourier model over the models developed in previous research."--iii-iv.

**Speed Estimation Techniques for Induction Motor Using Digital Signal Processing** Solly Aryza 2011 Speed estimation is one of the methods of speed sensor-less control for three phase induction motors. With the advancement of the power electronics switching devices and digital technologies, the developments of speed estimation methods have been intensively implemented from many researchers. Thus, this field of research has become more interested to investigate. Speed sensor-less control techniques can make the hardware simple and improve the reliability of the motor without the introducing the feedback sensor and it becomes more important in the modern AC servo drive. It is one of the attracting research directions in the high-precision servo control field because of its robust characteristics, simple realization and excellent dynamic response. Several common rotor speed estimation was introduced in the thesis. The model must accurately represent both the electrical and electromagnetic interactions within the machine and associated mechanical systems. In this Thesis, the neural networks controller for speed estimation has been developed approach to induction motor that has been implemented in digital signal processing controller (DSP) and gave the control signal to IGBT for run three phase inductions motor. Analysis of speed estimation nonlinear characteristics is carried out and makes a comparison with traditional linear method speed sensor less method. First, the simulation of the proposed control system is performed by using the MATLAB software and then the real time implementation is performed by using the MATLAB and the hardware. According to the mathematical model of the induction motor, the simulation of model and hardware implementation of speed sensor-less induction motor had been successfully implemented. The design and implementation of the speed estimation system for three-phase induction motor and the experimental research is presented in this Thesis. Finally, this Thesis shows the implementation of the speed estimation using DSP controller and the design of hardware and software for speed sensorless of induction motor. The experiment is completed at different speed and experiment results show that artificial neural network controller obtained a good response when compared to conventional methods.

**Proceedings of International Conference on Recent Trends in Machine Learning, IoT, Smart Cities and Applications** Vinit Kumar Gunjan 2020-10-17 This book gathers selected research papers presented at the International Conference on Recent Trends in Machine Learning, IoT, Smart Cities & Applications (ICMISC 2020), held on 29-30 March 2020 at CMR Institute of Technology, Hyderabad, Telangana, India. Discussing current trends in machine learning, Internet of things, and smart cities applications, with a focus on multi-disciplinary research in the area of artificial intelligence and cyber-physical systems, this book is a valuable resource for scientists, research scholars and PG students wanting formulate their research ideas and find the future directions in these areas. Further, it serves as a reference work anyone wishing to understand the latest technologies used by practicing engineers around the globe.

**Advanced Linear Machines and Drive Systems** Wei Xu 2019-09-07 This book collects the latest theoretical and technological concepts in the design and control of various linear machines and drive systems. Discussing advances in the new linear machine topologies, integrated modeling, multi-objective optimization techniques, and high-performance control strategies, it focuses on emerging applications of linear machines in transportation and energy systems. The book presents both theoretical and practical/experimental results, providing a consistent compilation of fundamental theories, a compendium of current research and development activities as well as new directions to overcome critical limitations.
Energy Storage Systems and Power Conversion Electronics for E-Transportation and Smart Grid - Sergio Saponara 2020-12-02
This is a reprint in book form of the Energies MDPI Journal Special Issue, entitled “Energy Storage Systems and Power Conversion Electronics for E-Transportation and Smart Grid”. The Special Issue was managed by two Guest Editors from Italy and Norway: Professor Sergio Saponara from the University of Pisa and Professor Lucian MIHET-POPA from Østfold University College, in close cooperation with the Editors from Energies. The papers published in this SI are related to the emerging trends in energy storage and power conversion electronic circuits and systems, with a specific focus on transportation electrification, and on the evolution from the electric grid to a smart grid. An extensive exploitation of renewable energy sources is foreseen for the smart grid, as well as a close integration with the energy storage and recharging systems of the electrified transportation era. Innovations at the levels of both algorithmic and hardware (i.e., power converters, electric drives, electronic control units (ECU), energy storage modules and charging stations) are proposed. Research and technology transfer activities in energy storage systems, such as batteries and super/ultra-capacitors, are essential for the success of electric transportation, and to foster the use of renewable energy sources. Energy storage systems are the key technology to solve these issues, and to increase the adoption of renewable energy sources in the smart grid.

2016 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES) - IEEE Staff
2016-07-04 The international conference will provide an opportunity to the practicing engineers, academicians, researchers, and students to meet in a forum to discuss various issues in Power Electronics, Intelligent Control and Energy Systems. In view of the changing scenario, the conference aims to put together the experts from these areas to disseminate their knowledge and experience for working towards soft computing techniques, electronics and energy sustainability in the years to come. The conference will spark innovative ideas, foster research relations or partnerships between the various institutions and build strong research and development community.

Industrial Engineering, Machine Design And Automation (Iemda 2014) - Proceedings Of The 2014 Congress & Computer Science And Application (Ccsa 2014) - Proceedings Of The 2nd Congress - Shihong Qin 2015-03-30 This proceedings put together 68 selected articles from the joint conferences of 2014 Congress on Industrial Engineering, Machine Design and Automation (IEMDA2014) and the 2nd Congress on Computer Science and Application (CCSA2014), held in Sanya, China during December 12 - 14, 2014. The conference program of IEMDA 2014 focused on areas of Industrial Engineering, Machine Design and Automation, while the CCSA 2014 program provided the platform for Computer Science and Applications. Collected together the latest research results and applications on industrial engineering, machine design, automation, and computer science and other related Engineering topics. All submitted papers to this proceedings were subjected to strict peer-reviewing by 2-4 expert referees, to ensure that all articles selected are of highest standard and are relevance to the conference.

High-Gain Observers in Nonlinear Feedback Control - Hassan H. Khalil 2017-06-23 For over a quarter of a century, high-gain observers have been used extensively in the design of output feedback control of nonlinear systems. This book presents a clear, unified treatment of the theory of high-gain observers and their use in feedback control. Also provided is a discussion of the separation principle for nonlinear systems; this differs from other separation results in the literature in that recovery of stability as well as performance of state feedback controllers is given. The author provides a detailed discussion of applications of high-gain observers to adaptive control and regulation problems and recent results on the extended high-gain observers. In addition, the author addresses two challenges that face the implementation of high-gain observers: high dimension and measurement noise. Low-power observers are presented for high-dimensional systems. The effect of measurement noise is characterized and techniques to reduce that effect are presented. The book ends with discussion of digital implementation of the observers. Readers will find comprehensive coverage of the main results on high-gain observers; rigorous, self-contained.
proofs of all results; and numerous examples that illustrate and provide motivation for the results. The book is intended for engineers and applied mathematicians who design or research feedback control systems.

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.

Artificial Intelligence and Renewables Towards an Energy Transition - Mustapha Hatti