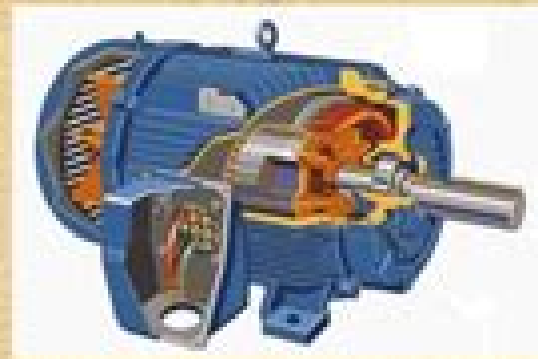


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FPGA DESIGN APPROACH OF DIGITAL CONTROL OF THREE- PHASE INDUCTION MOTOR



By: Prof Dr. Cesar da Costa

Speed Control Of Three Phase Induction Motor Using Fpga

Lei Huang



Speed Control Of Three Phase Induction Motor Using Fpga:

Speed Control of Induction Motor Using FPGA Based NI-GPIC Board Ammar Quaid Surti, 2015 Induction motors have been used in a wide range of home and industrial applications for the past several decades. In homes, induction motors are used in fans, water pumps, washing machines, dish washers, and garbage disposals. Industrial applications of induction motors are endless. They are used for conveyor belt movements, robotic arms, continuous process control, etc. For these applications, controlling the speed and torque of an induction motor is very important. Old control systems were not power efficient and had a number of flaws in their controls. Most flaws were due to carbon setting on the control circuitry contacts, causing problems in properly transmitting signals between points. Current control systems are mostly digitized and have a better response overall. The detailed study of induction motors has helped researchers understand and design better control systems that could consume less power and be more efficient. This project is designed to control a 3-phase induction motor through a newly designed development board from National Instruments, SbRIO 9606 GPIC Board, National Instruments, 2015. The control is designed using Labview software and the new FPGA toolbox Corporation, 2014. 4 by Brian MacCleery, Principal Product Manager for Clean Energy Technology and his team. This toolbox helps design the system graphically and writes the code automatically in the background to be compiled and run on the FPGA board. Methods used to control the induction motor are V/f control. Also, a comprehensive research has been done on controlling the motor through SVPWM (Space Vector Pulse Width Modulation). With the V/f control method, we will monitor the RPM (revolutions per minute) of the motor with open loop and closed loop systems. We will also look into the effects of the modulation index on the system and how modulation index affects the power quality. In addition, we will monitor any faults caused in the system by high current overshoots while turning on the motor or during speed change of the induction motor. We will also monitor the effects of the carrier frequency on the power quality. These experimental results are compared with the theoretical results for the verification of V/f control.

Neural and Fuzzy Logic Control of Drives and Power Systems Marcian Cirstea, 2002-10-08 Introduces cutting edge control systems to a wide readership of engineers and students. The first book on neuro-fuzzy control systems to take a practical applications based approach, backed up with worked examples and case studies. Learn to use VHDL in real world applications. Introducing cutting edge control systems through real world applications. Neural networks and fuzzy logic based systems offer a modern control solution to AC machines used in variable speed drives, enabling industry to save costs and increase efficiency by replacing expensive and high maintenance DC motor systems. The use of fast micros has revolutionised the field with sensorless vector control and direct torque control. This book reflects recent research findings and acts as a useful guide to the new generation of control systems for a wide readership of advanced undergraduate and graduate students, as well as practising engineers. The authors guide readers quickly and concisely through the complex topics of neural networks, fuzzy logic, mathematical modelling of electrical machines, power systems control, and VHDL design. Unlike

the academic monographs that have previously been published on each of these subjects this book combines them and is based round case studies of systems analysis control strategies design simulation and implementation The result is a guide to applied control systems design that will appeal equally to students and professional design engineers The book can also be used as a unique VHDL design aid based on real world power engineering applications

An FPGA Based Motor Drive for a Three-phase Induction Motor Bhanu Sri Pilla,2022 A three phase variable frequency drive with field programmable gate array FPGA control is investigated in this study With increasing demands in electric vehicles electric aircraft Unmanned Aircraft Systems and other applications the high performance motor drive employing variable frequency control with higher efficiency and reliability is an indispensable part of the ever changing technological development The main variable frequency control is based on the sinusoidal pulse width modulation SPWM technique with control hardware implemented by using a single FPGA chip The proposed SPWM control scheme has been realized using a Xilinx Arty A7 development board The system was tested with a 3 phase Infineon Trench FREDFET technology based on N channel IGBTs The control scheme regulates the AC output voltage precisely with a DC power supply Depending on the operating voltage and frequency the motor may be able to run above the rated speed to gain extra power Both simulations and test measurement results are shown

Recent Advances in Power Electronics and Drives Shailendra Kumar,Bhim Singh,Arun Kumar Singh,2022-05-26 This book contains select proceedings of EPREC 2021 with a focus on power electronics and drives The book includes original research and case studies that present recent developments in power electronics focusing on power inverters and converters The book also consists of research work on electrical drives regulated power supplies operation of FACTS HVDC etc The book will be a valuable reference guide for beginners researchers and professionals interested in the advancements of power electronics and drives

Proceedings of the International Conference on Intelligent Systems and Signal Processing Rahul Kher,Dr. Nikhil Gondaliya,Mukesh Bhesaniya,Latif Ladid,Mohammed Atiquzzaman,2018-01-18 The book provides insights into International Conference on Intelligent Systems and Signal Processing ISSP 2017 held at G H Patel College of Engineering Technology Gujarat India during March 24 25 2017 The book comprises contributions by the research scholars and academicians covering the topics in signal processing and communication engineering applied electronics and emerging technologies computer vision and machine learning big data and cloud computing and advanced intelligent power electronics and drives systems The main emphasis of the book is on dissemination of information experience and research results on the current topics of interest through in depth discussions and contribution of researchers from all over world The book is useful for research community academicians industrialists and post graduate students across the globe

Artificial Intelligence and Evolutionary Algorithms in Engineering Systems L Padma Suresh,Subhransu Sekhar Dash,Bijaya Ketan Panigrahi,2014-11-25 The book is a collection of high quality peer reviewed research papers presented in Proceedings of International Conference on Artificial Intelligence and Evolutionary Algorithms in Engineering Systems ICAEES 2014 held

at Noorul Islam Centre for Higher Education Kumaracoil India These research papers provide the latest developments in the broad area of use of artificial intelligence and evolutionary algorithms in engineering systems The book discusses 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

Proceedings of 4th Research Day 2022 Dr. A D Sarma, Commemorating CBIT s 43 years of successful Journey in the Field of Technical Education the Institute has organized the third Research Day in the Institute s Campus on 17 December 2022 by inviting the Research Scholars Faculty Students and other scientists from industry and institutions engaged in research to participate in the proceedings and present their works as abstracts There has been an overwhelming response not only from CBIT fraternity but also from the research community across India The meticulously selected Abstracts have been compiled and published as Book of Abstracts showcasing the Research in Progress and the outcomes of the completed Projects This compilation of Research Abstracts will serve as a source of knowledge and inspiration to the discerning researchers and also enable them to appreciate the challenges in developing the innovate products while showcasing on the present status of the products and their principles of operation undertaken by other Researches developers and enthusiastic engineers

Solar Electric Water and Air Tribid Auto Engine Chandan Deep Singh,Kanwaljit Singh,Davinder Singh,Talwinder Singh,Jasvinder Singh,Rajdeep Singh,2025-08-03 Solar Electric Water and Air Tribid Auto Engines is a must have for anyone in the automotive industry as it offers a comprehensive analysis of cutting edge technologies that could revolutionize vehicle design and fuel efficiency paving the way for a more sustainable future This book analyzes the performance of solar electric water and air based engines These technologies can be combined to create the revolutionary tribrid engine that combines the three technologies to create an environmentally friendly automobile Electric motors are known for their low emissions and solar has the potential to amplify this ability Water powered engines react with oxygen in the air to create fuel causing fewer emissions and improved fuel economy Compressed air motors are pressure driven diminishing our reliance on fossil fuels Their combined potential in the tribrid model presents revolutionary innovations for how we power automobiles This volume provides an in depth exploration of these technologies providing an advanced understanding of their fundamentals and potential for combination in a tribrid model making it essential for innovators in the automotive sector

Soft Computing Systems Ivan Zelinka,Roman Senkerik,Ganapati Panda,Padma Suresh Lekshmi Kanthan,2018-09-24 This book CCIS 837 constitutes the refereed proceedings of the Second International Conference on Soft Computing Systems ICSCS 2018 held in Sasthamcotta India in April 2018 The 87 full papers were carefully reviewed and selected from 439 submissions The papers are organized in topical sections on soft computing evolutionary algorithms image processing deep learning artificial intelligence big data analytics data minimg machine learning VLSI cloud computing network communication power electronics green energy

Utilizing an FPGA in Conjunction with a DSP Processor to Facilitate the Implementation of

Induction Motor Control John William Kelly,1997 Advanced Technologies for Solar Photovoltaics Energy Systems Saad Motahhir,Ali M. Eltamaly,2021-04-26 This book presents a detailed description analysis comparison of the latest research and developments in photovoltaic energy Discussing everything from semiconductors to system integration and applying various advanced technologies to stand alone and electric utility interfaced in normal and abnormal operating conditions of PV systems this book provides a thorough introduction to the topic This book brings together research from around the world covering the use of technologies such as embedded systems the Internet of things and blockchain technologies for PV systems for different applications including controllers solar trackers and cooling systems The book is of interest to electronic and mechanical engineers researchers and students in the field of photovoltaics **Proceedings of the ... Annual Conference of the IEEE Industrial Electronics Society** IEEE Industrial Electronics Society. Conference,2004
Proceedings of the IEEE International Conference on Industrial Technology (ICIT ...) ,2002 **Frontiers of Manufacturing and Design Science** Ran Chen,2010-12-06 Selected peer reviewed papers from the 2010 International Conference on Frontiers of Manufacturing and Design Science ICFMD 2010 Chongqing China December 11 12 2010
Proceedings VHDL International. Users Forum,2000 **Journal of Engineering for Gas Turbines and Power** ,1998
Proceedings VHDL International. Users Forum. Fall Workshop,2000 **EDN** ,2005 **ASME Technical Papers** ,1996 **Speed Control of Three-phase Induction Motor Using Variable Frequency Drive** Sagarkumar Patel,2018
Abstract There are various methods for speed control of induction motors This paper specifically describes one of the methods speed control using variable frequency The proposed system is a MATLAB simulink model which is a closed loop model designed to achieve desired speed control of a three phase induction motor by varying its frequency The simulink model has four main blocks namely the inverter synchronous machine proportional integral control and current hysteresis control For accuracy of output results and simplicity we have used dq to abc transformation block and sin function block The inverter is comprised of six integrated gate bipolar transistors IGBTs which are fired by gate pulses generated by current hysteresis control block The inverter generates variable frequency and variable voltage output which is given to motor terminals The project presents the working principle of variable frequency drive VFD its performance and the use of Pulse Width Modulation PWM in a three phase inverter to control the frequency and thus the speed The proposed method conformed to performance predictions and delivered the desired outputs

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Table of Contents Speed Control Of Three Phase Induction Motor Using Fpga

1. Understanding the eBook Speed Control Of Three Phase Induction Motor Using Fpga
 - The Rise of Digital Reading Speed Control Of Three Phase Induction Motor Using Fpga
 - Advantages of eBooks Over Traditional Books
2. Identifying Speed Control Of Three Phase Induction Motor Using Fpga
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Speed Control Of Three Phase Induction Motor Using Fpga
 - User-Friendly Interface
4. Exploring eBook Recommendations from Speed Control Of Three Phase Induction Motor Using Fpga
 - Personalized Recommendations
 - Speed Control Of Three Phase Induction Motor Using Fpga User Reviews and Ratings

- Speed Control Of Three Phase Induction Motor Using Fpga and Bestseller Lists
- 5. Accessing Speed Control Of Three Phase Induction Motor Using Fpga Free and Paid eBooks
 - Speed Control Of Three Phase Induction Motor Using Fpga Public Domain eBooks
 - Speed Control Of Three Phase Induction Motor Using Fpga eBook Subscription Services
 - Speed Control Of Three Phase Induction Motor Using Fpga Budget-Friendly Options
- 6. Navigating Speed Control Of Three Phase Induction Motor Using Fpga eBook Formats
 - ePub, PDF, MOBI, and More
 - Speed Control Of Three Phase Induction Motor Using Fpga Compatibility with Devices
 - Speed Control Of Three Phase Induction Motor Using Fpga Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Speed Control Of Three Phase Induction Motor Using Fpga
 - Highlighting and Note-Taking Speed Control Of Three Phase Induction Motor Using Fpga
 - Interactive Elements Speed Control Of Three Phase Induction Motor Using Fpga
- 8. Staying Engaged with Speed Control Of Three Phase Induction Motor Using Fpga
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Speed Control Of Three Phase Induction Motor Using Fpga
- 9. Balancing eBooks and Physical Books Speed Control Of Three Phase Induction Motor Using Fpga
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Speed Control Of Three Phase Induction Motor Using Fpga
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Speed Control Of Three Phase Induction Motor Using Fpga
 - Setting Reading Goals Speed Control Of Three Phase Induction Motor Using Fpga
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Speed Control Of Three Phase Induction Motor Using Fpga
 - Fact-Checking eBook Content of Speed Control Of Three Phase Induction Motor Using Fpga
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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