



Speed Estimation of Sensorless Induction Motor through Vector Control Using MRAS and Direct Synthesis Test

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To Cite this Article

G. Saeha Sai, Ch.Rajya Lakshmi, Ch. Vishnu Chakravarthi, "Speed Estimation of Sensorless Induction Motor through Vector Control Using MRAS and Direct Synthesis Test", *International Journal for Modern Trends in Science and Technology*, Vol. 02, Issue 11, 2016, pp. 116-123.

ABSTRACT

The objective of this project is to develop a vector controlled induction motor drive operating without a speed or position sensor but having a dynamic performance comparable to a sensed vector drive. This thesis presents the control of an induction motor through sensorless vector control using MRAS and also with direct synthesis test. The theoretical basis of each algorithm is explained in detail and its performance is tested with simulations implemented in MATLAB/SIMULINK. Vector control of induction motor is based upon the field-oriented co-ordinates aligned in the direction of the rotor m.m.f. However, there is no direct means of measuring the rotor flux linkage position p and therefore an observer is needed to estimate p for the implementation of sensorless vector control. First the Dynamic model of induction machine was developed in the arbitrary reference frame. Second, with the help of synchronous reference frame model the indirect field oriented vector control was developed. Third, Model Reference Adaptive System is studied as a state estimator. Rotor flux estimation scheme is applied to MRAS to estimate rotor speed. . By using the Direct Synthesis test, we can estimate the speed directly without feedback and control algorithm. This test can reduce the total cost.

KEYWORDS: Induction motor, Sensorless vector control, MRAS, Direct Synthesis test, MATLAB/SIMULINK.

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I. INTRODUCTION

In this thesis, the speed sensorless estimation concept via implementation of Model Reference Adaptive System (MRAS) schemes was studied[1]. It is a well-known fact that the performance of MRAS based speed estimators is beyond par from other speed estimators with regards to its stability approach and design complexity. Although this

thesis is all about MRAS based speed estimators, but it is also the aim of this project to investigate several speed sensorless estimation strategies for IMs. Explanations on the type of control strategies also were briefly discussed. As far as simulation works is concerned, the MRAS based speed sensorless estimation schemes chosen in this thesis have been implemented in the Field oriented

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Table of Contents Sensorless Speed Estimation Of An Induction Motor In A

1. Understanding the eBook Sensorless Speed Estimation Of An Induction Motor In A
 - The Rise of Digital Reading Sensorless Speed Estimation Of An Induction Motor In A
 - Advantages of eBooks Over Traditional Books
2. Identifying Sensorless Speed Estimation Of An Induction Motor In A
 - 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 Sensorless Speed Estimation Of An Induction Motor In A
 - User-Friendly Interface
4. Exploring eBook Recommendations from Sensorless Speed Estimation Of An Induction Motor In A
 - Personalized Recommendations
 - Sensorless Speed Estimation Of An Induction Motor In A User Reviews and Ratings
 - Sensorless Speed Estimation Of An Induction Motor In A and Bestseller Lists
5. Accessing Sensorless Speed Estimation Of An Induction Motor In A Free and Paid eBooks
 - Sensorless Speed Estimation Of An Induction Motor In A Public Domain eBooks
 - Sensorless Speed Estimation Of An Induction Motor In A eBook Subscription Services
 - Sensorless Speed Estimation Of An Induction Motor In A Budget-Friendly Options
6. Navigating Sensorless Speed Estimation Of An Induction Motor In A eBook Formats
 - ePub, PDF, MOBI, and More
 - Sensorless Speed Estimation Of An Induction Motor In A Compatibility with Devices
 - Sensorless Speed Estimation Of An Induction Motor In A Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Sensorless Speed Estimation Of An Induction Motor In A
 - Highlighting and Note-Taking Sensorless Speed Estimation Of An Induction Motor In A
 - Interactive Elements Sensorless Speed Estimation Of An Induction Motor In A

8. Staying Engaged with Sensorless Speed Estimation Of An Induction Motor In A
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Sensorless Speed Estimation Of An Induction Motor In A
9. Balancing eBooks and Physical Books Sensorless Speed Estimation Of An Induction Motor In A
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Sensorless Speed Estimation Of An Induction Motor In A
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Sensorless Speed Estimation Of An Induction Motor In A
 - Setting Reading Goals Sensorless Speed Estimation Of An Induction Motor In A
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Sensorless Speed Estimation Of An Induction Motor In A
 - Fact-Checking eBook Content of Sensorless Speed Estimation Of An Induction Motor In A
 - 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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