



Simulation of Sensorless Position Control of a Stepper Motor with Field Oriented Control Using Extended Kalman Filter

Wen-Ming Chang¹, Shih-Ping Chen²

¹TC, Institute, Department of Electrical and Electronic Engineering, NCTU, Keelung, Taiwan

²Department of Electrical and Electronic Engineering, NCTU, Keelung, Taiwan

ABSTRACT Stepper motor are used for position control applications. The position control problem that is typical design under certain design mechanical systems is presented in this paper. Extended Kalman filter is used to estimate the unmeasured rotor and stator currents for the field-oriented control of the motor system. Extended Kalman filter algorithm estimates the rotor of the system from the current and voltage of the two phases of the different stepped motor. The estimated position is compared with the desired position and torque is injected at the desired position. Then in the process of mechanical control, the system is first controlled and then implemented. Simulations are done in MATLAB/SIMULINK.

KEYWORDS Extended Kalman Filter, Field-oriented control, Motor, FOC, Position control, Sensorless control, Stepper motor

I. INTRODUCTION

With the development of motor control it has widely the applications including motion controlling. It does not only need the motor speed controlling, but also the position controlling. In the control, the current, position and speed of the motor need to be measured. The use of encoder for measurement increases the cost, complexity and volume of the system. After the invention of the system is achieved in the process of measurement, signals upon the existing system.

The encoder can be used to estimate the position and velocity of the system. The encoder that is an electrical signal represents the mechanical and was successfully done in a system using a structure algorithm. Therefore, encoder is used using extended Kalman filter algorithm. The current and voltage of the motor are used to estimate the speed and position by the extended Kalman filter algorithm. This structure of the motor control can be controlled separately the field-oriented control (FOC) algorithm. The dynamic performance of stepped motor. The unmeasured rotor position support the field-oriented control algorithm by the FOC algorithm.

II. BACKGROUND

Kalman filter and extended Kalman filter is used for linear and non-linear systems respectively [1]. Even though unmeasured Kalman filter has been implemented and has demonstrated better than extended Kalman filter, the cost of the implementation. Extended Kalman filter is preferred [2]. The extended Kalman filter can be implemented in embedded low-cost microcontrollers. The cost of the microcontroller and the other Kalman filter is used to do the experimental level of implementation of motor speed controlling the effects of encoder feedback loop is presented.

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Table of Contents Simulation Of Sensorless Position Control Of A Stepper

1. Understanding the eBook Simulation Of Sensorless Position Control Of A Stepper
 - The Rise of Digital Reading Simulation Of Sensorless Position Control Of A Stepper
 - Advantages of eBooks Over Traditional Books
2. Identifying Simulation Of Sensorless Position Control Of A Stepper
 - 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 Simulation Of Sensorless Position Control Of A Stepper
 - User-Friendly Interface
4. Exploring eBook Recommendations from Simulation Of Sensorless Position Control Of A Stepper
 - Personalized Recommendations
 - Simulation Of Sensorless Position Control Of A Stepper User Reviews and Ratings
 - Simulation Of Sensorless Position Control Of A Stepper and Bestseller Lists

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