



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

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ABSTRACT Stepper motor are used for position control applications. The position control method that is typical design using closed loop mechanical system 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 provides the rotor of the system from the current and voltage of the two phases of the different stepped motor. The controller is compared with the closed-loop control and torque is plotted at the desired position. This is the effect of mechanical system, the system is less sensitive and less expensive. Simulink is used to verify the system.

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

I. INTRODUCTION

With the development of motor control it can include the applications including control monitoring, control loop such that motor speed accuracy compared to the speed target. In the control loop control position and speed of the motor used as the reference. The use of feedback for measurement provides the most completely and robust of the system. After the stability of the system is achieved in the presence of disturbance signals upon the existing system.

The objective can be further achieved the use of extended Kalman filter of the system. The Kalman filter is an algorithm which estimates the unmeasurable and non-redundant states of a system using a recursive algorithm. Sometimes referred to as using extended Kalman filter algorithm. The current and voltage of the motor are used to estimate the speed and position for the extended Kalman filter algorithm. This technique of the sample current can be controlled separately the field oriented control (FOC) algorithm. The dynamic performance of stepped motor. The unmeasured rotor position support for the measurement provided by the FOC algorithm.

II. BACKGROUND THEORY

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 less sensitive error than extended Kalman filter, the cost of the implementation. Extended Kalman filter is preferred [2]. The extended Kalman filter can be implemented as nonlinear form [3] and discrete-time. The cost of the implementation of the extended Kalman filter is used to get the experimental level of unmeasured of motor speed controlling the effect of disturbance and delay is presented.

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The essence of this work is the control of electromechanical systems such as manipulators electric machines and power converters The common thread that links together the results presented here is the passivity property which is at present in numerous electrical and mechanical systems and which has great relevance in control engineering at this time Amongst other topics the authors cover Euler Lagrange Systems Mechanical Systems Generalised AC Motors Induction Motor Control Robots with AC Drives and Perspectives and Open Problems The authors have extensive experience of research and application in the field of control of electromechanical systems which they have summarised here in this self contained volume While written in a strictly mathematical way it is also elementary and will be accessible to a wide ranging audience including graduate students as well as practitioners and researchers in this field **IEE Proceedings** Institution of Electrical Engineers, 1999 Indexes IEE proceedings parts A through I Mechanism, Machine, Robotics and Mechatronics Sciences Rany Rizk, Mariette Awad, 2018-05-24 This volume contains the Proceedings of the First International Congress for the Advancement of Mechanism Machine Robotics and Mechatronics Sciences ICAMMRMS 2017 held in Beirut Lebanon October 2017 The book consists of twenty papers in six different fields covering multiple angles of machine and robotics sciences mechanical design control structural synthesis vibration study and manufacturing This volume is of interest to mechanical as well as electrical engineers Index to Theses with Abstracts Accepted for Higher Degrees by the Universities of Great Britain and Ireland and the Council for National Academic Awards ,2003 Theses on any subject submitted by the academic libraries in the UK and Ireland Dissertation Abstracts International ,2008

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