



# 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 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 and stator currents from the voltage and currents of the two phases of the different stepped motor. The estimated currents 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, Sensitivity 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 loop, current, position and speed of the motor need to be measured. The use of estimator for unmeasured currents can save complexity and reduce the cost of the system. After the estimation of the currents is achieved in the process of unmeasured signals upon the existing estimator.

The estimator can be used to estimate the unmeasurable states of the system. The Kalman filter is an estimator which estimates the unmeasurable and non-redundant states of a system using a recursive algorithm. Sometimes instead of using extended Kalman filter algorithm, The current and voltage of the motor are used to estimate the speed and position for the unmeasured Kalman filter algorithm. This technique of the current sensor can be considered separately the field oriented control (FOC) algorithm. The dynamic performance of stepped motor. The unmeasured rotor position support the field-oriented control controlled 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 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 as nonlinear form [3] and discrete form. The cost of the implementation for the linear Kalman filter is used to get the experimental level of unmeasured of motor speed controlling the effects of unmeasured feedback is presented.

# Simulation Of Sensorless Position Control Of A Stepper

**Dr. Viswaprakash Babu**



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