الآيـــــــــة

بسم الله الرحمن الرحيم

﴿وإذ قال ربك للملائكة إِنى جاعلٌ فى الأرض خَليفة قالوا أتجعل من يُفسد فيها ويسفك الدمآء ونَحن نُسبح بِحمدكَ ونُقدسُ لك قال إنى أعلم ما لاتَعلمونَ﴾

سورة البقرة (٣٠)

صدق الله العظيم

DEDICATION

I dedicate this thesis to my family, teachers, and friends.

A CKNOWLEDGEMENT

First of all, we would like to express our thanks to God for his great help in completing this project. After that there are numerous of people we need to thank for their advice, help, assistance and encouragement throughout the completion of this project.

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ABSTRACT

Vector control schemes are increasingly used in induction motor drive systems to obtain high performance. However, in order to implement the vector control technique, the induction motor speed information is required. Different speed sensors are used to detect the speed. But in most applications, speed sensors have several problems. These problems are eliminated by speed estimation by using different speed estimation algorithms. Out of which, model reference adaptive system techniques are one of the popular methods to estimate the rotor speed due to its good performance and simplicity. Each technique has advantages and drawbacks. In this project, the induction motor with rotor flux based model reference adaptive system rotor speed estimator is designed and validated through MATLAB/SIMULINK software package. The results of simulations show that the performance of the speed estimation is very good. The high performance of the proposed control scheme under different speed commands, load disturbances and parameter uncertainties is also demonstrated via simulation results.

مستخلص

تستخدم مخططات التحكم المتجهى بشكل متزايد فى أنظمة القيادة للمحرك الحثى للحصول على الأداء العالى. و رغم ذلك من أجل تنفيذ تقنية المتحكم المتجهى، مطلوب معلومة عن سرعة المحرك الحثى. تستخدم محساسات مختلفة لقياس للسرعة. و لكن في معظم التطبيقات، محساسات السرعة لديها العديد من المشاكل. يتم التقليل من هذه المشاكل عن طريق تقدير السرعة باستخدام خوارزميات مختلفة لتقدير السرعة. منها، تقنيات نظام النموذج المرجعي التكيفى التى تعتبر واحدة من الطرق الشائعة لتقدير السرعة نظراً لأدائها الجيد والبساطة. كل تقنية منها لها مزايا وعيوب. فى هذه المشروع، تم تصميمه المحرك الحثى مع فيض العضو الدوار بناءاًعلى نظام النموذج المرجعي التكيفى لتقدير السرعة وتم التحقق منها من خلال حزمة برنامج MATLAB/SIMULINK. نتائج المحاكاة تبين أن أداء السرعة المقدرة جيدة جدا تحت ظروف التشغيل المختلفة.

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LIST OF SYMBOLS

J	Moment of inertia, kg/m^2
L_m	Magnetising inductance, H
L_s	Stator inductance, H
L_r	Rotor inductance, H
p	Number of pole pairs
R_s	Stator resistance, Ω
R_r	Rotor resistance, Ω
T_e	Electrical torque, Nm
T_L	Load torque, Nm
σ	Leakage factor
θ_e	Synchronous angle, rad
θ_r	Rotor and angle, rad
ω_e	Synchronous frequency, rad/s
ω_r	Rotor frequency, rad/s
ω_{sl}	Slip frequency, rad/s
B	Viscous friction coefficient of motor, Nms
K_p	Proportional gain for PI controller
K_i	Integral gain for PI controller

LIST OF ABBREVIATIONS

DC	Direct Current
AC	Alternating Current
IM	Induction motor
VC	Vector Control
FOC	Field Oriented Control
DVC	Direct Vector Control
IVC	Indirect Vector Control
LO	Luenberger Observer
KF	Kalman Filters
AI	Artificial Intelligence
SMO	Sliding Mode Observers
MRAS	Model Reference Adaptive System
RP-MRAS	Reactive Power based Model Reference Adaptive System
RF-MRAS	Rotor Flux based Model Reference Adaptive System
PI	Proportional plus Integral