قال تعالى:

﴿ بسم الله الرحمن الرحيم (1) الحمد لله رب العالمين (2) الرحمن الرحيم (3) مالك يوم
الدين (4) إياك نعبد وإياك نستعين (5) اهدنا الصراط المستقيم (6) صراط الذين أنعمت
عليهم غير المغضوب عليهم ولا الضالين (7) ﴾

صدق الله العظيم

سورة الفاتحة الآيات {1-7}

DEDICATION

To my Mother,

To the soul of my father,

To my husband,

To my sisters and brother, without their help, support, and patience, I could not have done this effort.

ACKNOWLEDGEMENTS

First, I would like to thank Uncle ALI to his support and encouragement .

I would like to thank and appreciate the effort which was done by my advisor Dr. Nagm Eldean Abdo Mustafa Hassanian.

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Without the support and encouragement of my family, and friends I would never have finished my degree.

Last, I would like to thank my dead father to his believe on me.

ABSTRACT

This research presents a performance based comparative study fuzzy PI controller to control the speed of squirrel-cage induction motor (SCIM) by replacing the conventional proportional–integral (PI) controller.

Performances of fuzzy PI controller also compared with the conventional PI speed controller in terms of several performance measures such as peak overshoot (Mp%), settling time (Ts).

The indirect vector control is simulated both with PI and Fuzzy pi controller and results are analyzed and compared. Fuzzy pi controller is found to perform better than the conventional PI controller.

المستخلص

هذا البحث يقيم اداء المحرك الحثى عند استخدام المتحكم التناسبى التكاملى الغامض بدلا عن المتحكم التناسبى التكاملى.

المـــتحكم التناســـبى التكـــاملى الغـــامض تمـــت مقارنتـــه بـــالمتحكم التناســـبى التكاملى وقياس الاداء بواسطة اقصى قيمة لتجاوز الحد وزمن الاستقرار.

نظـــام الـــتحكم بتوجيـــه المجـــال تـــم تمثيلـــه بواســـطةالمتحكم التناســـبى التكـــاملى الغامض والمتحكم التناسبى التكاملى والنتائج تم تحليلها ومقارنتها.

وجد ان المتحكم التناسبى التكاملى الغامض افضل من اداء المتحكم التناسبى التكاملى

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LIST OF SYMBOLS

Symbol	Description
N_s	Synchronous speed
R_r	Rotor resistance
R_s	Stator resistance
J	inertia
ΔT	Change of Torque
i_q , i_q	Direct &Quadrature axis current
L_s	Stator inductance
L_r	Rotor inductance
ψ	The multiplication of the flux linkage λ by the rated angular Speed
p	The $d/_{dt}$ operator
λ	The flux linkage
ω_e	Stator frequency
ω_r	Rotor electrical speed
$v_{qs}, v_{ds,}, v_{qr}, , v_{dr}$	The voltages of stator and rotor in dq reference frame
i_{qs} , i_{ds} , $i_{qr,}i_{dr}$	The currents of stator and rotor indq reference frame
$\psi_{qs}, \psi_{ds}, \psi_{qr},$	The flux linkages of stator and rotor in dq reference
p	Number of poles
Te	The electromagnetic torque
Δi_{qs}^*	The components of stator current producing by torque
i_{qs}^*	The actual control signal U or current
L_d	Direct axes inductance

L_q	Quadrate axes inductance
k_p, k_i	The proportional and integral gain factors respectively
ω_2^*	The slip speed
ω_r^*	The reference command speed
E, e	the error
CE, ΔE, Δe	derivative of error
T^*	The output torque
Ts	The sampling time
n_p	The motor's pole-pair
T_L	The load torque
I_a I_b I_c	Three phase currents
i_{qs}^s , i_{ds}^s	The currents of stator and rotor in stationary dq reference frame
i_{qs}^e , i_{ds}^e	The currents of stator and rotor in synchronous dq reference frame
ρ	Angular position
$\theta 2$	The slip speed angle
θr	The rotor angle

LIST OF ABBREVIATIONS

DTC	Direct torque control
MOSFET	Metal Oxide Silicon Field Effect Transistor
IGBT	Insulated Gate Bipolar Transistor
PWM	pulse width modulation
PWM-VSI	pulse width modulation-voltage Source inverter
SVPWM	space vector pulse width modulation
VFD	variable frequency drive
FOC	field oriented control
IFO	indirect field oriented control
DFO	direct field oriented control
DTC	direct torque control
IM	induction machine
FLC	fuzzy logic controller
MF	membership function
COA	centre of area
MP%	over shoot
Ts	settling time