DEPARTMENT OF ELECTRICAL ENGINEERING

DELHI TECHNOLOGICAL UNIVERSITY

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CERTIFICATE

I, Maruti Nandan Mishra, Roll No. 2K12/C&I/09 student of M. Tech. (Control & Instrumentation), hereby declare that the dissertation titled "**FUZZY IMPLEMENTATION FOR DIRECT TORQUE CONTROL OF THREE PHASE INDUCTION MOTOR**" is the bonafide record of the work carried one by me under the supervision of Dr. Bharat Bhushan, Associate Professor of Electrical Engineering Department Delhi Technological University in partial fulfillment of the requirement for the award of the degree of Master of Technology and not been submitted elsewhere for the award of any Degree.

Maruti Nandan Mishra
(2K12/C&I/09)
Place: Delhi
Date: 7 July 2014

Dr. Bharat Bhushan
Associate Prof., EED, DTU

ABSTRACT

Induction motors are the starting point to design an electrical drive system which is widely used in many industrial applications. In modern control theory, different mathematical models describe induction motor according to the employed control methods. Vector control strategy can be applied to this electrical motor type in symmetrical three phase version or in unsymmetrical two phase version. The operation of the induction motor can be analysed similar to a DC motor through this control method. With the joint progress of the power electronics and numerical electronics it is possible today to deal with the axis control with variable speed in low power applications. With these technological projections, various command approaches have been developed by the scientific community to master in real time, the flux and the torque of the electrical machines, the direct torque control (DTC) scheme being one of the most recent steps in this direction. This scheme provides excellent properties of regulation without rotational speed feedback. In this control scheme the electromagnetic torque and stator flux magnitude are estimated with only stator voltages and currents and this estimation does not depend on motor parameters except for the stator resistance.

In this dissertation report conventional DTC scheme has been described. Induction motor has been simulated in stationary d-q reference frame and its free acceleration characteristics are drawn. To reduce the ripple in current and voltage waveform space vector PWM method is also employed and fuzzy logic control is also implemented.

The space vector modulation technique (SVPWM) is applied to 2 level inverter control in the vector control based induction motor drive system, thereby dramatically reducing the torque ripple. Later in this project fuzzy logic control technique will be applied to DTC drive system to reduce the torque ripple.

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DECLARATION

I, MARUTI NANDAN MISHRA hereby declare that the work, which is being presented in the project report entitled, **"FUZZY IMPLEMENTATION OF DIRECT TORQUE CONTROL OF THREE PHASE INDUCTION MOTOR"** submitted for partial fulfillment of the requirements for the award of the degree of Mater of Technology (CONTROL AND INSTRUMENTATION) is an authentic record of my own work carried out under the able guidance of DR. BHARAT BHUSHAN, Associate Professor, EED, DTU. The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Submitted by:-

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ACRONYMS

ASD	Adjustable Speed Drives
I	Current in Ampere
IM	Induction Motor
L	Inductance in hennery
N	speed in rpm
N-m	Newton-meter
P	Numbers of poles
R	Resistance in ohms
SVPWM	Space Vector Pulse Width Modulation
FLC	Fuzzy logic controller
t	Time in second
T	Torque in N-m
V	Voltage in volts
X	Reactance in ohms
Z	Impedance in ohms
Φ	Phase angle
Ψ	Flux linkage in volts-second
ω	Angular speed in rad/sec

Subscripts:

a, b, c	A,B,C phase sequence components
s, r	stator and rotor quantities
q, d	quadrature axis and direct axis components
0	zero sequence components
em	electromagnetic
m	magnetizing component
b	base quantities
sl	slip quantities

Superscripts:

s, r	stationary and rotor reference frame
e	synchronously rotating frame
abc	matrix notation of any phase quantities
qd0	matrix notation of any *q, d, 0* quantities