DIRECT TORQUE CONTROL OF INDUCTION MOTOR FOR SPEED CONTROL USING BACK PROPAGATION IN ARTIFICIAL NEURAL NETWORK

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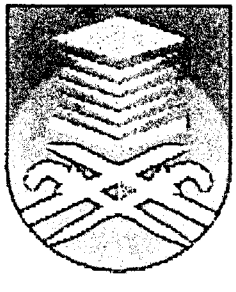
UNIVERSITI TEKNOLOGI MARA



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ABSTRACT

This report presents Artificial Neural Network controller for direct torque control, (DTC) induction motor drives. ANN speed controller for an induction motor which behaves similar to PI (Proportional and integral) controller. The model of induction motor is designed using the relevant equations. A closed-loop system is used for testing. The induction motor speed is control by ANN Technique using samples obtained from the classical technique (PI controller) and Direct Torque Control (DTC) controller. The data for training ANN is generated by simulating a model of the induction motor using SIMULINK. In supervised session, back propagation method will be applied in ANN programs. Comparison is made between classical technique and ANN technique.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Induction motors are widely used in industrial and household applications since it can easily be controlled and simpler in manufacturing [1]. A large-scale power application such as pump and mill use three-phase induction motor, while a single-phase induction motor is used in small-scale power for household appliances. There are four types of speed control for induction motor, i.e. V/f control, field oriented control, vector control, and direct torque control.

In this paper, variable speed control of three-phase induction motor is being simulated using SIMULINK, MATLAB based on direct torque control, (DTC) scheme proposed by Takahashi [2] and direct self-control, (DSC) by Depenbrock [3] in the 80's. Three-phase induction motor is modeled from space vector mathematical equations that describe machine variables in terms of quadrature axis (q-axis) and direct axis (d-axis) [4]. The space vector model is used since it can demonstrate the machine's dynamic and transient behaviour, which cannot be determined by well known 'approximate equivalent circuit'.

Artificial Neural Network (ANN) are successfully implemented in power electronics and motor drives areas such as motor control system, early detection of electrical machine faults, digital signal processing (DSP) of motor's parameter etc. Back propagation method–training algorithm that was introduced by Rumelhart, Hinton, and Williams in 1986 commonly trains the feed forward ANN. The distributed weights in the network contribute to the distributed associative memory property of network. Initially the untrained network, for instance, weights selection in random manner, the output signal pattern will