سامية محمد مصطفى



شبكة المعلومات الحامعية

بسم الله الرحمن الرحيم



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سامية محمد مصطفي



شبكة العلومات الحامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم





سامية محمد مصطفى

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسو

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



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سامية محمد مصطفي



شبكة المعلومات الجامعية



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سامية محمد مصطفى

شبكة المعلومات الحامعية



بالرسالة صفحات لم ترد بالأصل



CAIRO UNIVERSITY

FACULTY OF ENGINEERING

ELECTRICAL POWER & MACHINES DEPARTMENT

MICROCOMPUTER CONTROLLED TORQUE IN DC. DRIVES

A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE MASTER DEGREE OF SCIENCE

IN ELECTRICAL ENGINEERING

BY

MOHAMED MOSTAFA RAMADAN AHMED

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OF

INDUSTRIAL EDUCATION COLLEGE

UNDER SUPERVISION OF

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Cairo University

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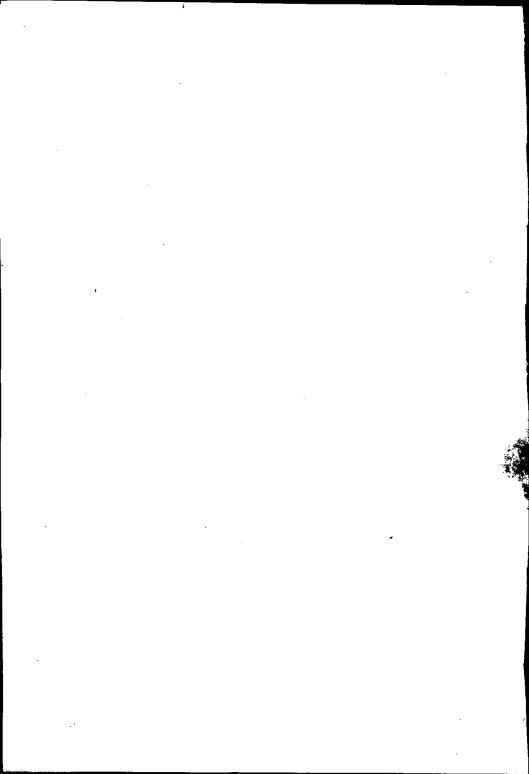
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1994

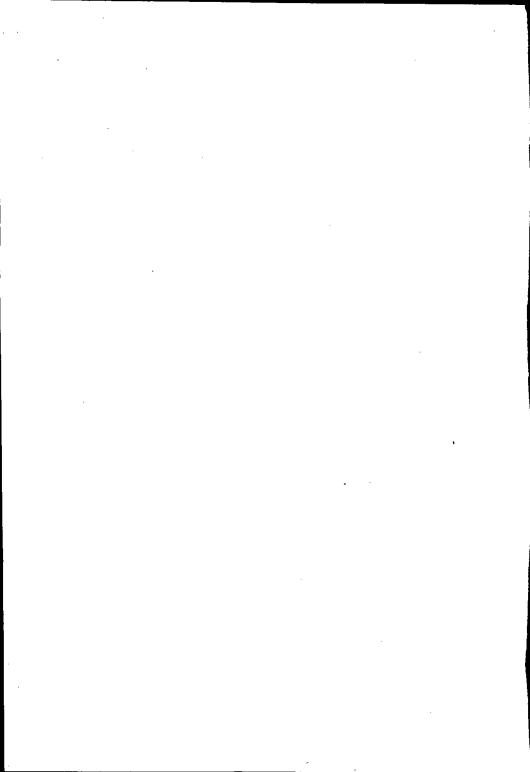
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ABSTRACT

Many applications, such as diesel - electric locomotives or all-electric automobiles, and steel plant, require fast torque control.

The object of this thesis is to control the torque of DC separately excited motor fed from single phase half controlled converter, using microcomputer.

There are many techniques to determine torque, using either direct or indirect methods. The biggest problem of the direct method using a torque- meter with, (e.g., strain gauges built into a wheatstone bridge) is that measuring device must be placed between the motor, and the load respectively.

This thesis avoid this difficulty by using the indirect method, particularly by measuring some quantities of the DC. machine itself, such as voltage, current, and speed, which are easier to determine experimentally, since any mechanical impact on the installation is avoided, this technique is clearly advantageous in practice.

The thesis presents the system configuration and gives an explanation of the architecture and features of the system.

The thesis deals with the simulation of the systems using the TUTSIM dynamic simulation program which is capable of simulating the control system with a digital controller in the loop.

A built in parameter estimation routine is employed to achieve control parameter optimization, Pl. control of the system is presented.

The implementation of microcomputer based - torque control of DC separately excited motor with P and PI controllers is presented. Experimental results and typical oscillographs of the drive characteristics are provided.

This thesis consists of five chapters described briefly as follows:

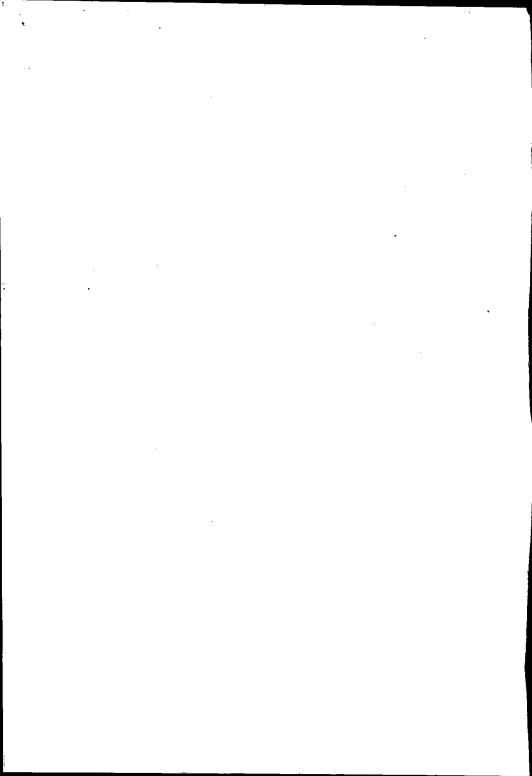
Chapter (1) Presents the literature review, and introduces the motor transfer function

Chapter (2) presents the system description and explains the practical circuits.

Chapter (3) Presents the simulation of the system using the TUTSIM simulation program, and gives the method to obtain the controller parameters.

Chapter (4) Introduces the programming of the interface card, the flowchart of the software program and gives the practical results including the on-line plots of the motor speed, armature current, and shaft torque versus time.

Chapter (5) Presents the general conclusion of this thesis and also the proposed future work.



LIST OF SYMBOLS

ea applied armature voltage

eg back EMF or generated voltage

Ra Armature winding resistance

La armature inductance

ia armature current

Ka Φ Back EMF and torque const

= Vrated - In Ra

Orated

Td developed torque

J moment of inertia

T_L load torque

β Friction Coefficient

 $T_a = La / Ra$ electrical time const

 $\tau_m = J/\beta$ mechanical time const

if field current

 $C_1 = \underline{R_1}$

 $R_a + R_1$

C2,C3,C4 Constants

B flux density

Vb brush voltage drop

N motor speed

α firing angle

y temperature coefficient.

φ flux

1

T_{sh} motor shaft torque

 ΔP power loss

P_{el} electrical input power

P_{mech} mechanical output power

P_{em} electromagnetic power

KP proportional gain.

Ki integral gain.

e error signal

 ΔP_{fric} friction loss

ΔP_{iron} iron loss

 ΔP_{ohm} ohmic loss

 Δ P_{add} additional load - dependent loss

 ΔP_h hysteresis loss

 ΔP_e eddy current loss

T_i integral time constant

T_D derivative time constant