

سامية محمد مصطفى



شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم



سامية محمد مصطفى



شبكة المعلومات الجامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



سامية محمد مصطفى



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



سامية محمد مصطفى



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



سامية محمد مصطفى



شبكة المعلومات الجامعية



بالرسالة صفحات لم ترد بالأصل



**Fuzzy Inference System and Neuro-Fuzzy Systems for Analog Circuits
Fault Diagnosis**

By

Samah Mohamed El-Shafie Mohamed El-Tantawy

B.Sc. in Electronics and Communications Engineering – Cairo University

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in
Engineering Mathematics

Faculty of Engineering, Cairo University

Giza, Egypt

July 2007

171 / 7

B

18140

**Fuzzy Inference System and Neuro-Fuzzy Systems for Analog Circuits
Fault Diagnosis**

By

Samah Mohamed El-Shafie Mohamed El-Tantawy
B.Sc. in Electronics and Communications Engineering – Cairo University

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in
Engineering Mathematics

Supervised by
Dr. Mohamed A. El-Gamal
Professor, Dept. of
Engineering Math. & Physics,
Faculty of Engineering,
Cairo University.

M. El-Gamal

Faculty of Engineering, Cairo University

Giza, Egypt

July 2007

Faculty of Electronics and Communications Engineering - Cairo University
General Supervisor: Mr. Shafiq Mohamed El-Tantawy

As a condition required to the
Faculty of Engineering at Cairo University
in partial fulfillment of the
requirements for the Degree of
Master of Science
in
Electronics and Communications

Approved by:

.....
.....

.....
.....

.....
.....

Fuzzy Inference System and Neuro-Fuzzy Systems for Analog Circuits Fault Diagnosis

By

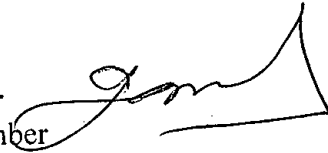
Samah Mohamed El-Shafie Mohamed El-Tantawy

B.Sc. in Electronics and Communications Engineering – Cairo University

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in
Engineering Mathematics

Approved by the Examining Committee:

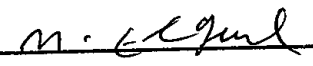
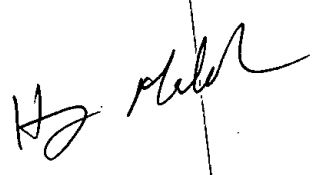
Prof. Dr. Mohamed G. Darwish

Member 

Prof. Dr. Hany L. Abdel-Malek

Member 

Prof. Dr. Mohamed A. El-Gamal

Thesis Main Advisor 


Faculty of Engineering, Cairo University
Giza, Egypt
July 2007

ACKNOWLEDGEMENTS

I would like to express my gratitude to all those who helped me to complete this thesis. The all thanks are for ALLAH the most merciful, the most beneficent for all his bounties that help me completing this thesis and in all my life.

I would like to express my deep gratitude and grateful thanks to my supervisor *Professor M. A. El-Gamal*, who kindly supervised this thesis, enlightened me with many ideas and constructive comments, and for his valuable guidance and support. He also provided me with a lot of references that were very essentials for the completion of this work. In addition, he has been a source of inspiration and encouragement. I fall short of words when I try to express my gratitude for his valuable help.

I would like to thank all staff members of the department of Engineering Mathematics & Physics, Faculty of Engineering, Cairo University, who provided great assistance.

Many thanks are given to my family, my husband and his family for their continuous support, patience, sacrifice, help, care, and encouragement. I am also grateful to all my friends for their enthusiastic support.

TABLE OF CONTENTS

TABLE OF CONTENTS	v
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xiv
LIST OF FIGURES.....	xiv
LIST OF ABBREVIATIONS	xx
LIST OF ABBREVIATIONS	xx
ABSTRACT.....	xxii
CHAPTER 1.....	1
INTRODUCTION	1
1.1 Soft Computing Constituents.....	1
1.2 Analog Fault Diagnosis Techniques	3
1.2.1 Fault Dictionary Techniques	4
1.2.2 Approximation Techniques.....	5
1.2.3 Parameter Identification Techniques.....	6
1.2.4 Fault Verification Techniques.....	6
1.2.5 Artificial Intelligence Techniques.....	6
1.2.5.1 Traditional Approaches	7
1.2.5.2 Model-Based Approaches	7
1.2.5.3 Machine Learning Approaches.....	7
1.2.5.4 Soft Computing Approaches	8
1.3 Importance of Fuzzy Logic and neural network-based techniques for Analog Fault Diagnosis	10
1.4 Thesis Objectives.....	10
CHAPTER 2.....	13

FUZZY LOGIC SYSTEMS AND NEURAL NETWORKS.....	13
2.1 Fuzzy Logic System.....	13
2.1.1 Fuzzy sets.....	13
2.1.2 Principal Fuzzy Logic Operations:.....	16
2.1.3 Fuzzy If-Then Rules.....	18
2.1.4 Fuzzy Reasoning.....	19
2.1.5 Fuzzy Inference Systems (FISs).....	21
2.1.5.1 Mamdani Fuzzy Models.....	22
2.1.5.2 Sugeno Fuzzy Models.....	23
2.2 Neural Networks (NNs).....	25
2.2.1 Back Propagation Neural Networks.....	25
2.2.1.1 Network Structure.....	25
2.2.1.2 Network Training.....	27
CHAPTER 3.....	29
NEURO-FUZZY COMBINATIONS.....	29
3.1 Types of Neuro-Fuzzy Combination.....	30
3.1.1 Concurrent Neuro-Fuzzy System.....	31
3.1.2 Integrated Neuro-Fuzzy Systems.....	31
3.1.2.1 Fuzzy-Neural Network (FNN).....	32
3.1.2.2 Neural-Fuzzy System (NFS).....	34
3.1.2.2.1 Cooperative System.....	35
3.1.2.2.2 Hybrid Neuro-Fuzzy Systems.....	36
3.2 Related Works.....	37
3.2.1 FNNs.....	37
3.2.2 NFSs.....	39
3.2.2.1 Cooperative Models.....	39