

SPEED CONTROL OF DC MOTOR UNDER VARIOUS LOADING CONDITIONS

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IN
CONTROL & INSTRUMENTATION**

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**DEDICATED TO
MY FATHER**

ABSTRACT

Brush-less DC motor have been widely used as motor motion recently, because Brush-less DC motor has advantages than other motors, such as the efficiency is better 13% than induction motor, the volume is smaller 40% than conventional DC motor^[19]. The other advantages, caused no brush so they require little or no maintenance, they generate less acoustic and electrical noise than conventional DC motor, they can be used in hazardous operation environments (with flammable products)^[20]. Fuzzy logic and Neural Network based controller is recently getting increasing emphasis in process control applications for their ease of adaptation to new control parameters.

This desertion presents the performance comparison of PID Controller and Adaptive Neuro-Fuzzy Logic controller to control speed of a DC motor and Brush-less DC motor when subjected to various loading condition as well as parameter change which happens over a time. To control high-speed motor, a high control frequency is required and also it is difficult to achieve high performance with a conventional controller. The fuzzy control is used to linearize the Torque-speed characteristics of Motor at various loading pattern as well as parameter variation and Neural Network gives easy adaptation to new control parameters. A MATLAB/SIMULINK model of DC motor and BLDC motor speed control using PID and Adaptive Neuro-Fuzzy technique is compared.

CONTENTS

Certificate	(ii)
Acknowledgement	(iii)
Abstract	(v)
Contents	(vi)
List of Figures	(x)
List of Tables	(xii)
List of Symbols and abbreviations	(xiii)
CHAPTER 1 INTRODUCTION	1
1.1 General	1
1.2 Control Techniques	2
1.3 Motivation	4
1.4 Objective of Thesis	5
1.5 Overview of Thesis	5
1.6 Conclusion	7
CHAPTER 2 LITERATURE REVIEW	8
2.1 DC Motor	8
2.1.1 General	8
2.1.2 Principal of Operation	10
2.2 BLDC Motor	12
2.2.1 General	12
2.2.2 Principal of Operation	13

CHAPTER 3 MODEL DEVELOPEMENT	15
3.1 PMDC Motor	15
3.1.1 Elecrical Characteristics	15
3.1.2 Mechanical Characteristics	17
3.1.3 State Space Representantion	18
3.1.4 Transfer Function Block Digram	19
3.2 BLDC Motor	20
3.2.1 Elecrical Characteristics	20
3.2.2 Mechanical Characteristics	22
3.2.3 Transfer Function Block Digram	22
3.2.4 State Space Representantion	23
CHAPTER 4 CONTROLLER	25
4.2.1 General	25
4.2 Conventional Controller	26
4.2.1 Proportional Controller	26
4.2.1 Proportional Plus Integral	27
4.2.2 PID Controller	27
4.3 Non-Conventional Controller	29
4.3.1 Fuzzy Controller	29
4.3.1.1 Fuzzification	30
4.3.1.2 Rule Base	31
4.3.1.3 Defuzzification	32
4.3.2 Neural Network	33
4.3.2.1 Design of neural network	35

CHAPTER 5 CONTROLLER TUNING	36
5.1 General	36
5.2 Performance Criterion	37
5.2.1 Time domain	37
5.2.2 Frequency domain	37
5.3 Tuning method	38
5.3.1 Conventional	38
5.3.1.1 Continuous Cycle Method	38
5.3.1.2 Process Reaction Curve Method	39
5.3.2 Non- Conventional	41
5.3.2.1 Learning methods	42
CHAPTER 6 RESULTS AND DISCUSSION	44
6.1 DC Motor	44
6.1.1 DC Motor Parameters	44
6.1.2 PID Controller Parameters	44
6.1.3 Simulink model of DC Motor with PID	45
6.1.4 Simulink model of DC Motor with ANFIS	45
6.1.5 Results of DC Motor with PID at fixed load	46
6.1.6 Results of DC Motor with PID at parameter change	46
6.1.7 Discussion	47
6.2 BLDC Motor	47
6.2.1 BLDC Motor Parameters	47
6.2.2 PI Control Parameters	47

6.2.3	Simulink model of BLDC Motor with PI	48
6.2.4	Simulink model of DC Motor with ANFIS	48
6.2.5	Results of BLDC Motor at NO load	49
6.2.6	Results of BLDC Motor at Step Load	49
6.2.7	Results of BLDC Motor at Noisy Load	50
6.2.8	Results of BLDC Motor at Sinosoidal Load	50
6.2.9	Results of BLDC Motor at Parameter variation	51
6.2.10	Discussion	51
CHAPTER 7 CONCLUSION AND FUTURE SCOPE		52
CHAPTER 8 REFERENCES		55
List of Publication of Candidate's work		58

LIST OF FIGURES

Figure 2.1	: Cut-View of DC motor.	9
Figure 2.2	: Torque production in a DC motor.	10
Figure 2.3	: Induced voltage in the armature winding of DC motor	11
Figure 2.4	: Cross-sectional view of Brush-less DC motor	12
Figure 2.5	: Driving circuitry of Brush-less DC motor	13
Figure 3.1	: Electrical Representation of PMDC motor	16
Figure 3.2	: Block diagram representation of eqns. (3.19) and (3.20)	19
Figure 3.3	: Block diagram representation of PMDC motor driving fixed load	20
Figure 3.4	: Brushless DC Motor Schematic Diagram	21
Figure 3.5	: Simplified equivalent circuit of BLDC motor	21
Figure 4.1	: Block diagram of a PID Controller	28
Figure 4.2	: Block diagram of a Fuzzy Controller	30
Figure 4.3	: Different membership functions available	30
Figure 4.4	: Membership function in Simulink Environment	31
Figure 4.5	: Rule base formulation in Simulink environment	32
Figure 4.6	: Single node In a MLP Network	33
Figure 4.7	: A MLP Network with single hidden layer	34
Figure 6.1	: Simulink model of DC Motor with PID	45
Figure 6.2	: Simulink model of DC Motor with ANFIS	45
Figure 6.3	: Results of DC Motor with PID at fixed load	46
Figure 6.4	: Results of DC Motor with PID at parameter change	46

Figure 6.5	: Simulink model of BLDC Motor with PI	48
Figure 6.6	: Simulink model of DC Motor with ANFIS	48
Figure 6.7	: Results of BLDC Motor at NO load	49
Figure 6.8	: Results of BLDC Motor at Step Load	49
Figure 6.9	: Results of BLDC Motor at Noisy Load	50
Figure 6.10	: Results of BLDC Motor at Sinosoidal Load	50
Figure 6.11	: Results of BLDC Motor at Parameter variation	51

LIST OF TABLES

S. N.	TABLE	
Table-5.1	: Control Parameters suggested by Zeigler and Nichols	39
Table-5.2	: Control Parameters suggested by Tyreus and Luben	39
Table-5.3	: Control Parameters suggested by Zeigler and Nichols	40
Table-5.4	: Control Parameters suggested by Cohen and Coon	41
Table 6.1	: Transient response sheet of DC motor	47
Table 6.2	: Transient response sheet of DC motor	51

LIST OF SYMBOLS AND ABBREVIATIONS

BLDC :	Brushless DC motor
FLC :	Fuzzy Logic Controller
PMDC :	Permanent Magnet DC motor
FIU :	Fuzzy Inference Unit
MLP :	Multiple Layer Perceptron
θ :	Rotor Position
U_d :	DC bus voltage
e_A :	Phase back emf
r_a :	Line resistance of winding, $=2R$.
L_a :	Equivalent line inductance of winding, $=2(L-M)$.
J :	Rotor moment of inertia.
T_L :	Load torque.
i :	Line current.
ω :	Rotor speed.
B_v :	Viscous friction coefficient.
K_e :	Coefficient of line back emf.
K_T :	Coefficient of line torque constant.
M :	Mutual linkage, (assume $M=0$).