

SOME STUDIES ON THE CONTROL AND ESTIMATION IN
POWER SYSTEMS THROUGH SYSTEM SUB-DIVISION

BY

P. LINGA REDDY

Department of Electrical Engineering

submitted

in fulfilment of the requirements of
the degree of Doctor of Philosophy

to the

Indian Institute of Technology, Delhi

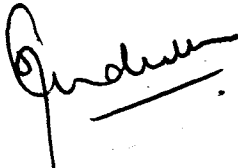
July 1977

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CERTIFICATE

This is to certify that the thesis entitled 'Some studies on the control and estimation in power systems through system sub-division', which is being submitted by P. Linga Reddy for the award of degree of Doctor of Philosophy in Electrical Engineering to the Indian Institute of Technology, Delhi, is a record of the student's own work carried out by him under our joint supervision and guidance.

The matter embodied in this thesis has not been submitted to any other university or Institute for the award of any other degree or diploma.



(Dr. C.S. Indulkar)
Department of Electrical
Engineering
Indian Institute of
Technology
New Delhi-110029.



(Dr. B.S. Rao)
Department of Electric
Engineering
Indian Institute of
Technology
New Delhi-110029.

ACKNOWLEDGEMENT

I wish to express my profound gratitude to Dr. B.S. Rao and Dr. C.S. Indulkar for their invaluable guidance and inspiration in carrying out the work and for their immense help in the preparation of this thesis.

I would like to thank the authorities of the Jawaharlal Nehru Technological University, Hyderabad, A.P., India, for my deputation to I.I.T. Delhi for research work and the Ministry of Education, Government of India for the award of a scholarship under the Quality Improvement Programme.

I further wish to thank the authorities of I.I.T. Delhi for providing research facilities and to the staff of the Computer Centre, I.I.T. Delhi for their whole-hearted cooperation.

I extend my thanks to my colleagues Dr.S. Vittal Rao and Dr. K.S. Reddy, Electrical Engineering Department, I.I.T. Delhi for their useful suggestions and discussions and to Mr. Gulati, Mechanical Engineering Department, I.I.T. Delhi to his efficient typing.

I appreciate the cooperation received from my wife Rajya Laxmi and my children, Radhika, Lavanya and Kishore during the three years of my stay at Delhi.

New Delhi

July 1977

P. Linga Reddy 25/7/77
(P. LINGA REDDY)

TO
MY PARENTS

ABSTRACT

Methods, such as reduced order models, system decoupling through feedback, state vector partitioning, hierarchical control, etc. have been developed in the literature to reduce the computational burden and storage requirements for the control of large practical systems. In this thesis, a technique, called, the system sub-division method, is developed in order to overcome the difficulties of the state vector partitioning and hierarchical control methods.

In the system sub-division method, the given large system is divided into several lower order sub-systems using a non-singular transformation due to Crossley. This transformation matrix can be obtained through a systematic procedure unlike the arbitrary selection of this matrix adopted in the state vector partitioning method. Since the sub-systems obtained through Crossley's transformation are not suitable for independent treatment for the computation of either control or estimate of each sub-system, the dynamic equations of the sub-systems are modified in the system sub-division method to make them amenable for independent treatment.

The suitability of the system sub-division method to power system problems is verified by applying it to a two-area automatic generation control problem and to a synchronous machine connected to an infinite bus working under wide-range operating conditions. The theoretical expressions for the degradation in

performance and stability of the original system are derived, when the control law obtained through the system sub-division method is implemented to the original system.

In addition, the suitability of an hierarchical method to power system problems is verified through a two-area automatic generation control example and a synchronous machine connected to an infinite bus. In the latter problem an output control law, which needs only available outputs and guarantees the stability of the closed loop system, is derived.

CONTENTS

			<u>Page</u>
CHAPTER-	I	INTRODUCTION	
	1.1	Introduction ..	1
	1.2	Organization of thesis ..	3
CHAPTER-	II	REVIEW OF PREVIOUS WORK IN RELATED AREAS	
	2.1	Introduction ..	7
	2.2	State vector partitioning method ..	7
	2.2.1	Sub-optimal linear estimation ..	8
	2.2.2	Sub-optimal linear control ..	10
	2.3	Crossley canonical transformation..	17
	2.4	Automatic generation control ..	24
	2.5	Hierarchical methods ..	28
	2.6	Wide range controllers ..	31
	2.7	Output controllers ..	35
	2.8	Conclusions ..	37
CHAPTER-	III	SUB-OPTIMAL CONTROL THROUGH SYSTEM SUB-DIVISION	
	3.1	Introduction ..	38
	3.2	Optimal control ..	40
	3.3	Sub-optimal control through system sub-division ..	42
	3.3.1	System sub-division ..	42
	3.3.2	Sub-system modification ..	43
	3.3.3	Sub-optimal control law ..	44
	3.4	Stability of the closed loop system ..	46

		<u>Page</u>
3.5	Degradation in performance ..	47
3.6	Numerical example ..	50
3.6.1	Sub-optimal control through system sub-division ..	51
3.6.2	Sub-optimal control through state vector partitioning method due to Meditch ..	53
3.7	Conclusions ..	54
CHAPTER- IV	SUB-OPTIMAL ESTIMATION THROUGH SYSTEM SUB-DIVISION	
4.1	Introduction ..	56
4.2	Optimal estimation ..	57
4.3	Sub-optimal estimation through system sub-division ..	58
4.3.1	System sub-division ..	58
4.3.2	Sub-optimal estimation ..	59
4.3.3	Improved sub-optimal estimation ..	62
4.4	Numerical example ..	62
4.6	Conclusions ..	64
CHAPTER- V	AUTOMATIC GENERATION CONTROL THROUGH SYSTEM SUB-DIVISION	
5.1	Introduction ..	65
5.2	Deterministic load changes ..	66
5.2.1	Optimal controller ..	66
5.2.2	Sub-optimal controller ..	68
5.3	Stochastic load changes ..	72
5.4	Application to a two-area power system.	75
5.4.1	Sub-optimal controller for 1 per cent deterministic load change in area 1 ..	78

		<u>Page</u>
5.4.2	Stochastic sub-optimal controller for uncertain load changes ..	80
5.5	Conclusions ..	81
CHAPTER- VI	AUTOMATIC GENERATION CONTROL VIA HIERARCHICAL CONTROL METHOD	
6.1	Introduction ..	82
6.2	Problem formulation ..	83
6.3	Pseudo-model coordination method ..	85
6.3.1	Hierarchical control law ..	87
6.4	Application to a two-area power system ..	91
6.5	Conclusions ..	95
CHAPTER- VII	A WIDE RANGE SUB-OPTIMAL CONTROLLER FOR A POWER SYSTEM	
7.1	Introduction ..	97
7.2	Wide range controller without system sub-division ..	98
7.3	Wide range controller through system sub-division ..	100
7.4	Stochastic wide range controller without system sub-division ..	103
7.5	Stochastic wide range controller through system sub-division ..	105
7.6	Numerical example ..	107
7.6.1	Deterministic case ..	108
7.6.2	Stochastic case ..	113
7.6.3	Three-phase fault ..	117
7.7	Conclusions ..	118

		<u>Page</u>
CHAPTER-VIII	AN OUTPUT FEEDBACK CONTROLLER FOR A POWER SYSTEM	
8.1	Introduction	.. 119
8.2	Problem formulation	.. 120
8.3	Solution of the problem	.. 121
8.3.1	System decomposition	.. 123
8.3.2	Sequential coordination	.. 126
8.3.3	Computational procedure	.. 128
8.4	Numerical example	.. 129
8.5	Conclusions	.. 134
CHAPTER- IX	CONCLUSIONS AND SUGGESTIONS	
9.1	Conclusions	.. 136
9.2	Suggestions for further work	.. 140
REFERENCES 143
APPENDIX-A:	Stability of the closed loop system with sub-optimal controller	.. 152
APPENDIX-B:	B1 To prove that $R_{si} = L_i R_i L_i^T$.. 154
	B2 Relationship between the output matrices of the original system and of sub-systems	.. 154
APPENDIX-C:	Model and Data for the two-area power system	.. 156
APPENDIX-D:	Model and Data for the two-area automatic generation control problem	.. 158
APPENDIX-E:	Model and Data for the wide range controller	.. 160
AUTHOR' s BIO-DATA		