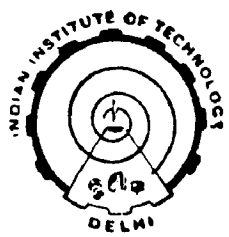
FAIL SAFE SIGNAL PROCESSING TECHNIQUES USING MICROPROCESSORS AND APPLICATION TO DESIGN AND DEVELOPMENT OF ROUTE INTERLOCKING SYSTEM FOR RAILWAYS

by

M. R. VERMA

A Thesis submitted to the
Indian Institute of Technology, Delhi
for the award of the degree of

DOCTOR OF PHILOSOPHY



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April 1987

to Rita, my wife

CERTIFICATE

This is to certify that the thesis entitled "Fail safe signal processing techniques using microprocessors and application to design and development of route interlocking system for railways", being submitted by M.R.Verma to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy, is a record of bonafide research work carried out under my supervision. The results contained in this thesis have not been submitted for the award of any degree or diploma.

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ACKNOWLEDGEMENT

I am extremely grateful to my supervisor, Dr. Vinod Chandra for his guidance and constant encouragement during the work.

My thanks are due to Prof. N. K. Nanda, Electronics and Communication Engineering Department, University of Roorkee for his valuable suggestions from time to time.

I am thankful to Prof. A. B. Bhattacharya, Head, Centre for Applied Research in Electronics for allowing me to use the facilities of the Centre.

The project was supported financially by the Information Planning and Analysis Group, Electronics Commission, Department of Electronics, Govt. of India.

I am also thankful to Shri V. Ramasamy, Executive Director (S & T), Railway Board for his support and encouragement. My thanks are also due to Shri M. K. Bapat, Ex Director (S & T), R.D.S.O., Lucknow for his useful suggestions.

My thanks are due to Shri M. Subramanian and Shri M. R. Muralidhar for their valuable help.

My thanks to Shri K. R. Bobal, Shri R. P. Kapoor and Mrs. R. K. Mansukhani for bringing out the thesis in this form.

My special thanks are due to my wife Rita for giving me the moral support during the work.

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ABSTRACT

The thesis deals with design and development of a real time control system FIRM (Fail safe Interlocking system for Railways using Microprocessors) for control of trains in a station yard. Route interlocking is a critical application involving the safety of human lives. The design is based on fail safe principles where a fault in the system causes a safe reaction.

A new approach has been propsed for the design of fail safe systems. The approach is based on need based safety levels where different subsystems are implemented to the safety levels required by them. This reduces the system complexity and provides an increased standard of safety compared to the systems which are implemented to a uniform standard of safety. A simulator for the design validation of route interlocking systems has been described. The interlocking system for any given yard and its control environment can be simulated and fault can be injected at various levels.

The FIRM architecture employing dual hardware and software diversity of processors, and a number of hardware functional modules has been described. Development of an engineeering prototype of FIRM, its laboratory testing, reliability and safety analysis, and experimental installation have also been discussed.

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