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Edited by A.V. Balakrishnan and M. Thoma

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Dines Chandra Saha
Ganti Prasada Rao

Identification of Continuous Dynamical Systems

The Poisson Moment Functional (PMF) Approach



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TO
OUR FAMILIES

(DCS)

Rina
Aniruddha

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Meenakshi
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P R E F A C E

In order to overcome the difficulties associated with the derivative measurement problem in continuous model identification (CMI), certain techniques have appeared in the literature around the early nineteen sixties. Some of these depend on off-line computation of certain definite integrals. The Poisson moment functional (PMF) method appeared in the early nineteen seventies to render the technique on-line, by realising the necessary integrals as the physically measurable outputs at the various stages of a Poisson filter chain (PFC) system. The PMF method at that stage was in a form without adequate generality and was applicable to a limited class of continuous models. In the last few years, considerable work has been done in this area. The basic PMF method has been generalized. Conditions of identifiability have been established. Modifications of the general PMF algorithm to handle models containing unknown time delays and nonlinear elements have been suggested. Methods of structure identification have been reported. The PMF method in noisy situations has been assessed. Recently, Kalman filtering applied to the PFC is found to give excellent results in noisy situations removing the earlier difficulties due to correlated noise at the various stages of the PFC. With its extension to MIMO models and to distributed parameter systems, the PMF method has attained a level of maturity and generality in CMI.

In this book the authors have attempted to put together the various developments in the PMF area in a comprehensive form. Relevant discussions on the relationship of the PMF method with certain other techniques are presented at appropriate places. The authors hope that this book will be of interest to those working in the area of CMI.

The authors are indebted to several colleagues for their assistance at various stages of preparation of this book. In particular, at the Indian Institute of Technology, Kharagpur, Professors C.N.Kaul (Mathematics) and N. Kesavamurthy (Electrical Engineering) reviewed the initial version of the manuscript and gave constructive comments. They are grateful to Professor H. Unbehauen, Lehrstuhl für Elektrische Steuerung und Regelung, Ruhr-Universität Bochum, for his interest, encouragement and advice throughout the preparation of the book. Ganti Prasada Rao gratefully acknowledges the support received from the Alexander von Humboldt Foundation which greatly helped in the realisation of this book. The authors are grateful to Frau H. Hupp, Frau P. Kiesel and Frau E. Schmitt

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