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Numerical Studies in Nonlinear Filtering

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PREFACE

State estimation techniques were developed for situations in engineering in which, based on nonlinear and noise-corrupted measurements of a process, and on a good model of the process, the process is estimated either on-line or off-line using the available measurements.

These techniques became known in the early sixties under the celebrated name of Kalman filtering, and were applied mainly to linear problems. Later developments by Kushner, Wonham and others led to solutions to nonlinear state estimation problems, in which, in general, infinite-dimensional filters are required. Practical algorithms, such as the linearized and extended Kalman filters, which involve only finite-dimensional filters, have been most frequently used as approximate solutions to these nonlinear state estimation problems.

The present work offers some new approaches to the construction of finite-dimensional filters as approximate solutions to nonlinear state estimation problems. Numerical procedures for the implementation of these filters are given, and the efficiency and applicability of these procedures is demonstrated by means of numerical experimentation.

It is my pleasant duty to record here my sincere thanks to the National Research Institute for Mathematical Sciences of the CSIR for encouraging this research. I gratefully acknowledge the contribution made by Mrs. H C Marais, Mrs. R de Villiers and Miss H M Tönsing, who wrote the computer programs for the examples presented here.

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Yaakov Yavin

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