Digital Signal Processing and Control and Estimation Theory: Points of Tangency, Areas of Intersection, and Parallel Directions (The MIT Press series in signal processing, optimization, and control)

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The purpose of this book is to explore several specific areas of research in two distinct but related fields: digital signal processing and modern control and estimation theory. There are enough similarities *and* differences in the philosophies, goals, and analytical techniques of the two fields to indicate that a concerted effort to understand these better might lead to some useful interaction and collaboration among researchers.

The author writes that his examination "will in general not be result-oriented. Instead, I have been most interested in understanding the goals of the research and the methods and approach used. Understanding the goals may help us to see why the techniques used in the two disciplines differ. Inspecting the methods and approaches may allow one to see areas in which concepts in one field may be usefully applied in the other. The book undoubtedly has a control-oriented flavor, since it reflects the author's background and also since the original purpose of this study was to present a control theorist's point of view at the 1976 Arden House Workshop on Digital Signal Processing. However, an effort has been made to explore avenues in both disciplines in order to encourage researchers in the two fields to continue along these lines."

Indeed, the book contains numerous suggestions for new research directions and speculations on possible new results, all of them a direct result of the purposeful mixing of the ideas of the two disciplines. For the benefit of researchers who may wish to follow up some of these suggestions and speculations, the author has assembled a comprehensive bibliography, consisting of more than 600 references.

In order to achieve his unique perspective of viewing each field in the context of the other, the author examines such topics as stability analysis of feedback control systems and digital filters subject to the effects of finite wordlength arithmetic; linear prediction, parameter identification, and relationships involving Kalman filtering and "fast" algorithms; system synthesis, realization, and implementation; two-dimensional filtering, decentralized control and estimation, and some of their connections with image processing; and aspects of nonlinear system theory, including homomorphic and bilinear systems.

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