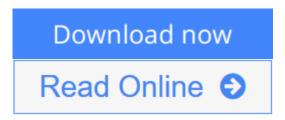# Time-Frequency Analysis and Synthesis of Linear Signal Spaces: Time-Frequency Filters, Signal Detection and Estimation, and Range-Doppler Estimation ... Series in Engineering and Computer Science)

By Franz Hlawatsch

Time-Frequency Analysis and Synthesis of Linear Signal Spaces: Time-Frequency Filters, Signal Detection and Estimation, and Range-Doppler Estimation ... Series in Engineering and Computer Science) By Franz Hlawatsch

Linear signal spaces are of fundamental importance in signal and system theory, communication theory, and modern signal processing.

This book proposes a time-frequency analysis of linear signal spaces that is based on two novel time-frequency representations called the `Wigner distribution of a linear signal space' and the `ambiguity function of a linear signal space'.

Besides being a useful display and analysis tool, the Wigner distribution of a linear signal space allows the design of high-resolution time-frequency filtering methods. This book develops such methods and applies them to the enhancement, decomposition, estimation, and detection of noisy deterministic and stochastic signals. Formulation of the filtering (estimation, detection) methods in the time-frequency plane yields a direct interpretation of the effect of adding or deleting information, changing parameters, etc. In a sense, the prior information and the signal processing tasks are brought to life in the time-frequency plane.

The ambiguity function of a linear signal space, on the other hand, is closely related to a novel maximum-likelihood multipulse estimator of the range and Doppler shift of a slowly fluctuating point target - an estimation problem that is important in radar and sonar. Specifically, the ambiguity function of a linear signal space is relevant to the problem of optimally designing a set of radar pulses.

The concepts and methods presented are amply illustrated by examples and pictures. *Time-Frequency Analysis and Synthesis of Linear Signal Spaces: Time-Frequency Filters, Signal Detection and Estimation, and Range-Doppler Estimation* is an excellent reference and may be used as a text for advanced courses covering the subject.

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From reader reviews:

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