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Nota di contenuto	Adaptive Radar Signal Processing; Contents; Preface; Acknowledgments; Contributors List; 1. Introduction; Experimental Radar Facilities; Organization of the Book; Part I Radar Spectral Analysis; 2. Angle-of-Arrival Estimation in the Presence of Multipath; 2.1 Introduction; 2.2 The Low-Angle Tracking Radar Problem; 2.3 Spectrum Estimation Background; 2.3.1 The Fundamental Equation of Spectrum Estimation; 2.4 Thomson's Multi-Taper Method; 2.4.1 Prolate Spheroidal Wavefunctions and Sequences; 2.5 Test Dataset and a Comparison of Some Popular Spectrum Estimation Procedures 2.5.1 Classical Spectrum Estimation2.5.2 MUSIC and MFBLP; 2.6 Multi-taper Spectrum Estimation; 2.6.1 The Adaptive Spectrum; 2.6.2 The Composite Spectrum; 2.6.3 Computing the Crude, Adaptive, and Composite Spectra; 2.7 F-Test for the Line Components; 2.7.1 Brief Outline of the F-Test; 2.7.2 The Point Regression Single-Line F-Test; 2.7.3 The Integral Regression Single-Line F-Test; 2.7.4 The Point Regression Double-Line F-Test; 2.7.5 The Integral Regression Double-Line F-Test; 2.7.6 Line Component Extraction; 2.7.7 Prewhitening; 2.7.8 Multiple Snapshots

2.7.9 Multiple Snapshot, Single-Line, Point-Regression F-Tests; 2.7.10 Multiple-Snapshot, Double-Line Point-Regression F-Tests; 2.8 Experimental Data Description for a Low-Angle Tracking Radar Study; 2.9 Angle-of-Arrival (AOA) Estimation; 2.10 Diffuse Multipath Spectrum Estimation; 2.11 Discussion; References; 3. Time-Frequency Analysis of Sea Clutter; 3.1 Introduction; 3.2 An Overview of Nonstationary Behavior and Time-Frequency Analysis; 3.3 Theoretical Background on Nonstationarity; 3.3.1 Multi-taper Estimates; 3.3.2 Spectrum Estimation as an Inverse Problem; 3.4 High-Resolution Multi-taper Spectrograms; 3.4.1 Nonstationary Quadratic-Inverse Theory; 3.4.2 Multi-taper Estimates of the Loeve Spectrum; 3.5 Spectrum Analysis of Radar Signals; 3.6 Discussion; 3.6.1 Target Detection Rooted in Learning; References; Part II Dynamic Models; 4. Dynamics of Sea Clutter; 4.1 Introduction; 4.2 Statistical Nature of Sea Clutter: Classical Approach; 4.2.1 Background; 4.2.2 Current Models; 4.3 Is There a Radar Clutter Attractor?; 4.3.1 Nonlinear Dynamics; 4.3.2 Chaotic Invariants; 4.3.3 Inconclusive Experimental Results on the Chaotic Invariants of Sea Clutter; 4.3.4 Dynamic Reconstruction; 4.3.5 Chaos, a Self-Fulfilling Prophecy?; 4.4 Hybrid AM/FM Model of Sea Clutter; 4.4.1 Radar Return Plots; 4.4.2 Rayleigh Fading; 4.4.3 Time-Doppler Spectra; 4.4.4 Evidence for Amplitude Modulation, Frequency Modulation, and More; 4.4.5 Modeling Sea Clutter as a Nonstationary Complex Autoregressive Process; 4.5 Discussion; 4.5.1 Nonlinear Dynamics of Sea Clutter; 4.5.2 Autoregressive Modeling of Sea Clutter; 4.5.3 State-Space Theory; 4.5.4 Nonlinear Dynamical Approach Versus Classical Statistical Approach; 4.5.5 Stochastic Chaos; References; Appendix A Specifications of the Three Sea-Clutter Sets Used in This Chapter

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## Sommario/riassunto

This collaborative work presents the results of over twenty years of pioneering research by Professor Simon Haykin and his colleagues, dealing with the use of adaptive radar signal processing to account for the nonstationary nature of the environment. These results have profound implications for defense-related signal processing and remote sensing. References are provided in each chapter guiding the reader to the original research on which this book is based.

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