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Nota di contenuto	Discrete Stochastic Processes and Optimal Filtering; Table of Contents; Preface; Introduction; Chapter 1. Random Vectors; 1.1. Definitions and general properties; 1.2. Spaces $L_1(dP)$ and $L_2(dP)$; 1.2.1. Definitions; 1.2.2. Properties; 1.3. Mathematical expectation and applications; 1.3.1. Definitions; 1.3.2. Characteristic functions of a random vector; 1.4. Second order random variables and vectors; 1.5. Linear independence of vectors of $L_2(dP)$; 1.6. Conditional expectation (concerning random vectors with density function); 1.7. Exercises for Chapter 1; Chapter 2. Gaussian Vectors 2.1. Some reminders regarding random Gaussian vectors 2.2. Definition and characterization of Gaussian vectors; 2.3. Results relative to independence; 2.4. Affine transformation of a Gaussian vector; 2.5. The existence of Gaussian vectors; 2.6. Exercises for Chapter 2; Chapter 3. Introduction to Discrete Time Processes; 3.1. Definition; 3.2. WSS

processes and spectral measure; 3.2.1. Spectral density; 3.3. Spectral representation of a WSS process; 3.3.1. Problem; 3.3.2. Results; 3.3.2.1. Process with orthogonal increments and associated measurements; 3.3.2.2. Wiener stochastic integral 3.3.2.3. Spectral representation 3.4. Introduction to digital filtering; 3.5. Important example: autoregressive process; 3.6. Exercises for Chapter 3; Chapter 4. Estimation; 4.1. Position of the problem; 4.2. Linear estimation; 4.3. Best estimate - conditional expectation; 4.4. Example: prediction of an autoregressive process AR (1); 4.5. Multivariate processes; 4.6. Exercises for Chapter 4; Chapter 5. The Wiener Filter; 5.1. Introduction; 5.1.1. Problem position; 5.2. Resolution and calculation of the FIR filter; 5.3. Evaluation of the least error 5.4. Resolution and calculation of the IIR filter 5.5. Evaluation of least mean square error; 5.6. Exercises for Chapter 5; Chapter 6. Adaptive Filtering: Algorithm of the Gradient and the LMS; 6.1. Introduction; 6.2. Position of problem; 6.3. Data representation; 6.4. Minimization of the cost function; 6.4.1. Calculation of the cost function; 6.5. Gradient algorithm; 6.6. Geometric interpretation; 6.7. Stability and convergence; 6.8. Estimation of gradient and LMS algorithm; 6.8.1. Convergence of the algorithm of the LMS; 6.9. Example of the application of the LMS algorithm 6.10. Exercises for Chapter 6 Chapter 7. The Kalman Filter; 7.1. Position of problem; 7.2. Approach to estimation; 7.2.1. Scalar case; 7.2.2. Multivariate case; 7.3. Kalman filtering; 7.3.1. State equation; 7.3.2. Observation equation; 7.3.3. Innovation process; 7.3.4. Covariance matrix of the innovation process; 7.3.5. Estimation; 7.3.6. Riccati's equation; 7.3.7. Algorithm and summary; 7.4. Exercises for Chapter 7; Table of Symbols and Notations; Bibliography; Index

Sommario/riassunto

Optimal filtering applied to stationary and non-stationary signals provides the most efficient means of dealing with problems arising from the extraction of noise signals. Moreover, it is a fundamental feature in a range of applications, such as in navigation in aerospace and aeronautics, filter processing in the telecommunications industry, etc. This book provides a comprehensive overview of this area, discussing random and Gaussian vectors, outlining the results necessary for the creation of Wiener and adaptive filters used for stationary signals, as well as examining Kalman filters which ar
