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Chapter 6. Adaptive Filtering: Algorithm of the Gradient and the LMS6. 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 case7.3. 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; 7.5. Appendices; 7.6. Examples treated using Matlab software; 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 are used in relation to non-stationary signals. Exercises with solutions feature in each chapter to demonstrate the practical application of these ideas using MATLAB.