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input signal assumptions; 2.2.2. LMS analysis using stochastic difference equations with stochastic coefficients; 2.3. Performance of statistical LMS theory; 2.4. Summary; 3. PtNLMS Analysis Techniques 3.1. Transient analysis of PtNLMS algorithm for white input 3.1.1. Link between MSWD and MSE; 3.1.2. Recursive calculation of the MWD and MSWD for PtNLMS algorithms; 3.2. Steady-state analysis of PtNLMS algorithm: bias and MSWD calculation; 3.3. Convergence analysis of the simplified PNLMS algorithm; 3.3.1. Transient theory and results; 3.3.2. Steady-state theory and results; 3.4. Convergence analysis of the PNLMS algorithm; 3.4.1. Transient theory and results; 3.4.2. Steady-state theory and results; 3.5. Summary; 4. Algorithms Designed Based on Minimization of User-Defined Criteria 4.1. PtNLMS algorithms with gain allocation motivated by MSE minimization for white input 4.1.1. Optimal gain calculation resulting from MMSE; 4.1.2. Water-filling algorithm simplifications; 4.1.3. Implementation of algorithms; 4.1.4. Simulation results; 4.2. PtNLMS algorithm obtained by minimization of MSE modeled by exponential functions; 4.2.1. WD for proportionate-type steepest descent algorithm; 4.2.2. Water-filling gain allocation for minimization of the MSE modeled by exponential functions; 4.2.3. Simulation results 4.3. PtNLMS algorithm obtained by minimization of the MSWD for colored input 4.3.1. Optimal gain algorithm; 4.3.2. Relationship between minimization of MSE and MSWD; 4.3.3. Simulation results; 4.4. Reduced computational complexity suboptimal gain allocation for PtNLMS algorithm with colored input; 4.4.1. Suboptimal gain allocation algorithms; 4.4.2. Simulation results; 4.5. Summary; Chapter 5. Probability Density of WD for PtLMS Algorithms; 5.1. Proportionate-type least mean square algorithms; 5.1.1. Weight deviation recursion 5.2. Derivation of the Conditional PDF of WD for the PtLMS algorithm

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## Sommario/riassunto

The topic of this book is proportionate-type normalized least mean squares (PtNLMS) adaptive filtering algorithms, which attempt to estimate an unknown impulse response by adaptively giving gains proportionate to an estimate of the impulse response and the current measured error. These algorithms offer low computational complexity and fast convergence times for sparse impulse responses in network and acoustic echo cancellation applications. New PtNLMS algorithms are developed by choosing gains that optimize user-defined criteria, such as mean square error, at all times. PtNLMS algorithms ar

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