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A BLIND SIGNAL-TO-NOISE RATIO ESTIMATOR FOR DIGITAL BANDPASS SIGNALS BASED ON A MODIFIED ITERATIVE SUBSPACE TRACKING ALGORITHM

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Abstract. *Signal-to-Noise Ratio (SNR) is an important parameter in communication systems. The SNR for the digital bandpass signals can be estimated by the Eigenvector Decomposition (ED) of the correlation matrix of the received data. But the heavy computational load confines its application. In this paper a new blind SNR estimator based on an iterative subspace tracking algorithm, called the modified Projection Approximation Subspace Tracking (PASTd), is proposed for the bandpass signals in the complex Additive White Gaussian Noise (AWGN). Further in order to guarantee the orthogonality of the estimated eigenvectors, a modified Gram-Schmidt method is introduced into the original PASTd algorithm. Compared with the ED-based method, the proposed algorithm can achieve a more accurate estimation with a simple computational complexity, thus is effective especially for on-line use. Simulations performed for the commonly used digital bandpass signals, such as 2/4/8 Phase-Shift Keying (PSK) and 16/64/128/256 Quadrature Amplitude Modulated (QAM) signals, verify its feasibility.*
Keywords: SNR estimation, Blind algorithm, Bandpass signals, Iterative algorithm, Subspace tracking, PSK, QAM

1. **Introduction.** The knowledge of Signal-to-Noise Ratio (SNR) is required for optimal performance in various algorithms, e.g. SNR is given as a priori information for turbo decoding [1], and it is also used for power control to maintain the required link quality in Code Division Multiple-Access (CDMA) systems. Among all the SNR estimation algorithms, those based on the pilots work well but at the cost of the channel throughput [2], therefore we are concerned with the estimators without the training sequence. The blind SNR estimators can be roughly divided into three categories, first is based on the second [3,4] and higher-order [5] statistics of the received data, second is based on the maximum likelihood (ML) principle which converts the SNR estimation to the amplitude ML-estimation of the target signal [6-9], and last is the Split Symbol Moment Estimator (SSME) [10] and its generalized form [11], which are based on the property that the signal of interest is correlated and the noise is uncorrelated in a single symbol interval. Although all of them work well for baseband signals in a synchronous system, their performance suffers greatly for bandpass signals in an asynchronous receiver.