Computer Science > Information Theory

Widely Linear vs. Conventional Subspace-Based Estimation of SIMO Flat-Fading Channels: Mean-Squared Error Analysis

Saeed Abdallah, Ioannis N. Psaromiligkos

(Submitted on 15 Jun 2011)

We analyze the mean-squared error (MSE) performance of widely linear (WL) and conventional subspace-based channel estimation for single-input multiple-output (SIMO) flat-fading channels employing binary phase-shift-keying (BPSK) modulation when the covariance matrix is estimated using a finite number of samples. The conventional estimator suffers from a phase ambiguity that reduces to a sign ambiguity for the WL estimator. We derive closed-form expressions for the MSE of the two estimators under four different ambiguity resolution scenarios. The first scenario is optimal resolution, which minimizes the Euclidean distance between the channel estimate and the actual channel. The second scenario assumes that a randomly chosen coefficient of the actual channel is known and the third assumes that the one with the largest magnitude is known. The fourth scenario is the more realistic case where pilot symbols are used to resolve the ambiguities. Our work demonstrates that there is a strong relationship between the accuracy of ambiguity resolution and the relative performance of WL and conventional subspace-based estimators, and shows that the less information available about the actual channel for ambiguity resolution, or the lower the accuracy of this information, the higher the performance gap in favor of the WL estimator.

Comments: 20 pages, 7 figures
Subjects: **Information Theory (cs.IT)**; Other Statistics (stat.OT)
Cite as: **arXiv:1106.2994 [cs.IT]**
(or **arXiv:1106.2994v1 [cs.IT]** for this version)

Submission history

From: Saeed Abdallah [view email]
[v1] Wed, 15 Jun 2011 15:20:44 GMT (175kb,D)

Which authors of this paper are endorsers?