Design of Multiuser Detector for Time-Hopping UWB M-SIMO Systems Based on Decorrelating-MRC Technigue

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ABSTRACT

In this paper, we propose a two-stage linear multiuser detector (LMD) for Ultra wideband (UWB) Multiple Single-input Multiple-output (M-SIMO) system and multipath fading environment. Time-hopping (TH) and antipodal pulse amplitude modulation (PAM) are employed for the multiple access system. The decorrelating detector is first employed at the front end of each receive antenna to eliminate the multi-user interference (MUI), then a set of maximum-ratio-combiners (MRC) are proceeded to maximize the signal-to-noise power ratio (SNR) for each user. Since the channel information is crucial for the Decorrelating-MRC (D-MRC) receiver, we develop a subspace-based blind M-SIMO channel estimation method. The effect of channel estimation error on system performance is extensively evaluated. It is also verified from the analytical and numerical results that by exploiting both spatial and temporal diversities, the D-MRC outperforms the conventional single-antenna decorrelating detector. Moreover, we demonstrate that both the decorrelating-MRC (D-MRC) receiver and subspace based M-SIMO channel estimators are computationally feasible and near-far resistant.

Keywords : UWB ; M-SIMO ; Time-hopping (TH) ; Decorrelating-MRC (D-MRC) ; multi-user interference (MUI)

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