Joint Channel Estimation and Symbol Detection for OSTBC in Frequency Selective Channels

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Abstract

Orthogonal space time block coding (OSTBC) in multiple-antenna systems has recently emerged as one of the most promising technologies for high-speed, high-quality data services. In a typical wireless environment, transmitted symbols arrive at the receiver corrupted by additive Gaussian noise, channel fading, and intersymbol interference. To fully explore the performance gains promised by OSTBC, robust techniques to achieve accurate channel estimation and symbol detection have received considerable attention. In this paper, we propose a technique to achieve channel estimation and symbol detection jointly for OSTBC in frequency selective channels. The key observation is that a multiple-input single-output (MISO) system using OSTBC can be translated to an equivalent single-input multiple-output (SIMO) system using the implicit redundancy in OSTBC. This allows a probabilistic method, called the Baum-Welch (BW) algorithm, to be applicable at each output branch. As each output branch is excited by the same input, redundant information can be exchanged between the multiple branches to improve the detection performance at individual branches. The proposed technique does not require multiple antennas at the receiver and only has moderate computational complexity. Furthermore, as a probabilistic algorithm, the proposed method can be concatenated with a channel decoder to form a turbo receiver which achieves remarkably good performance. Simulation results demonstrate the performance of the proposed algorithm and a comparable scheme.