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Transceiver Designs for Multipoint-to-Multipoint MIMO Amplify-and-Forward Relaying Systems

Abstract:

In this paper, we consider multipoint-to-multipoint multi-input multi-output relay systems where multiple source-destination pairs simultaneously communicate through a single multiple antenna relay. In this system configuration, we optimize two metrics when designing the source, relay and destination filters. The first one is sum mean-squared-error (MSE) and the second one is maximum pairwise MSE. These two problems are shown to be non-convex, and thus it is quite complex to find an analytical solution. To address this issue, we first introduce the sum MSE minimization scheme based on global channel state information (CSI) at all nodes. Then, a method which reduces complexity and CSI requirements is proposed by utilizing error covariance decomposition and MSE duality between broadcast channel and multiple access channel. Second, the pairwise MSE balancing algorithms are developed to guarantee fairness for all pairs. Similar to the case of the sum MSE minimization problem, we simplify the original pairwise MSE balancing problem to a second-order cone programming problem which can be solved using standard optimization tools. Through numerical simulations, we confirm the effectiveness of our proposed schemes.