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An Optimization Framework for XOR-Assisted Cooperative Relaying in Cellular Networks

Abstract:

This work seeks to address two questions in cooperative OFDMA networks: First, how network coding based cooperative diversity can be exploited effectively when overhearing is not readily available. Second, how to realize various forms of gains available, including multi-user diversity, cooperative diversity, and network coding. The main contribution of this paper is an unifying network utility maximization framework that jointly considers relay assignment, relay strategy selection, channel assignment and power allocation. We formulate the optimization problem both with and without XOR-CD, a simple XOR-assisted cooperative diversity scheme. We show that the optimization of physical layer resource allocation with XOR-CD is equivalent to a weighted 3-set packing problem, which is NP-complete, and can be efficiently solved with provably the best approximation factor. Without XOR-CD, the problem reduces to a weighted bipartite matching problem which can be optimally solved.