Joint Transceiver Designs for Full-Duplex K -Pair MIMO Interference Channel With SWIPT

Abstract:

In this paper, we propose joint transceiver design algorithms for the full-duplex K -pair multiple-input multiple-output interference channel with simultaneous wireless information and power transfer. To mitigate and exploit the complex interference, we consider two important utility optimization problems, i.e., the sum power minimization problem and the sum-rate maximization problem. In the first problem, our aim is to minimize the total transmission power under both transmission rate and energy harvesting (EH) constraints. An iterative algorithm based on alternating optimization (AO) and with guaranteed monotonic convergence is proposed to successively optimize the transceiver coefficients. The algorithm consists of three main steps, where the concave-convex procedure (CCCP), the minimum mean-square error (MMSE) criterion, and the semidefinite relaxation technique are, respectively, employed to compute the vectors of power splitting ratios, the receiving matrices, and the transmitting beamforming vectors. Two simplified algorithms based on fixed beamformers, namely, the maximum ratio transmission and the maximum signal-to-interference-leakage beamformers are also proposed. In the second problem, our aim is to maximize the sum-rate under additional power and EH constraints. Due to the highly non-convex nature of this problem, we first reformulate it into an equivalent-weighted MMSE problem by introducing suitable weight factors, such that the global optima of the two problems are identical. Then, by utilizing the concept of AO and CCCP, we show that the equivalent problem can be efficiently solved. Again, with the aid of the fixed beamformers, two simplified algorithms are provided to reduce the computational complexity. Simulation results are presented to validate the effectiveness of the proposed algorithms.