

Optimization of Beamforming Matrix Design for Multi-Cell MIMO with SWIPT Systems

Abstract

Energy harvesting is emerging as a promising new solution to provide continuous energy supplies to wireless rechargeable devices. This paper investigates wireless information and energy transfer in multi-cell multiple-input-multiple-output (MIMO) systems. An optimisation problem that designs the beamforming matrix is introduced to maximise the sum of total harvested energy collected from all energy receiving terminals while guaranteeing the desired data rate for each information receiving terminal remains above a certain level. Total power constraint at each transmitting terminal that was generated from the renewable energy and purchased from the grid is also considered. The channel capacity that requires the use of slower and less reliable CVX's successive approximation heuristic is formulated, and then, the non-convex problem is transformed into a convex problem form modelled by a semidefinite relaxation (SDR). The results show the effectiveness of the multiple antennas used in all cells provide better performance and also maximise the total harvested energy at all energy receiving terminals.

Keywords

Beamforming; energy harvesting; MU-MIMO; Simultaneous wireless information and power transfer (SWIPT)