A Cooperative SWIPT Scheme for Wirelessly Powered Sensor Networks

Abstract:

Wireless power transfer (WPT) provides a novel solution to the painstaking power-charging issue in wireless sensor networks. However, due to the propagation loss, the fast attenuation in energy transfer efficiency over the transmission distance is the main impediment to the WPT application. In this paper, we apply the simultaneous wireless information and power transfer (SWIPT) to a wirelessly powered sensor network, where each node has two circuits, which operate on energy harvesting mode and information decoding mode separately. We propose a novel cooperative SWIPT scheme (CSS) for this system. First, we present a conflict-free schedule initialization algorithm for CSS. For a given conflict-free schedule, we formulate a resource allocation problem to maximize the network energy efficiency, which is then transformed to an equivalent convex optimization problem and resolved via dual decomposition. Finally, a heuristic algorithm is presented to achieve the transmission schedule with the maximum energy efficiency and the corresponding resource assignment policy. Simulation results indicate that the CSS can significantly improve the energy efficiency of the wirelessly powered sensor network.