Abstract

This work concentrates the recently developing remote wireless powered communication network in which one hybrid access point (H-AP) with constant power supply coordinates the wireless energy/information transmissions to/from a set of distributed users that do not have other energy sources. A “harvest-then- transmit” procedure is planned where all client first harvest(save) the wireless energy transmit by the H-AP in the downlink(DL) and then send their autonomous information to the HAP in the uplink (UL) by time-division-multiple-access (TDMA). First, we study the sum-throughput maximization of all users by jointly optimizing the time allocation for the DL wireless power transfer versus the users’ UL information transmissions given a total time limit based on the users’ DL and UL channels as well as their average harvested energy values. By applying convex optimization techniques, we obtain the closed form expressions for the optimal time allocations to maximize the sum-throughput. Our clarification reveals an attractive “doubly-near-far” phenomenon due to both the DL and UL distance dependent signal attenuation, where a far user from the HAP, which receives less wireless energy than a nearer user in the DL, has to transmit with more power in the UL for
reliable information transmission. As a result, the maximum sum throughput is revealed to be achieved by allocating significantly more time to the near users than the far users, thus resulting in unfair rate allocation among different users. To overcome this problem, we furthermore propose a new performance metric so called common-throughput with the additional constraint that all users should be allocated with an equal rate regardless of their distances to the H-AP. In this work, We solve the common-throughput maximization problem. Simulation results demonstrate the effectiveness of the common-throughput approach for solving the new doubly near-far problem in communication network.

References

16. T. F. Coleman and Y. Li, “An interior trust region approach for nonlinear minimization
17. “On the convergence of reflective newton methods for large-scale nonlinear minimization

19. Yong Zeng, Bruno Clerckx, and Rui Zhang, “Communications and Signals Design for

Index Terms

Computer Science Wireless

Keywords

Wireless power, Doubly near-far problem, TDMA, Convex optimization.