Review Report

Title: Energy-Efficient Optimization Joint User Scheduling and Resource Allocation in OFDMA Relay Networks

Conference: IEEE WCNC 2013

Summary: This paper mainly proposes two resource allocation algorithms, energy-efficient global optimization algorithm and energy-efficient maximization greedy algorithm, aiming to improve the energy efficiency in OFDMA relay networks. Simulation results show that two algorithms could achieve high energy efficiency than a spectral-efficient maximization greedy algorithm. In addition, the paper also proposes a packet scheduling scheme to determine the prioritization of each packet in the queue for resource allocation.

Strong Points:

1) OFDMA based on relay networks is one of the most promising solutions for the next generation wireless communication system. The resource management in OFDMA relay network is very challenging and crucial. To my knowledge, few contribution has been done on the energy-efficient resource scheduling and allocation in OFDMA relay network. It's very good to see this paper studying such a topic of considerate practical interest and importance.
2) Before resource allocation, a novel scheduling scheme is used to assign different priorities to the packets in the queue to guarantee the fairness and better system throughput when different types of service with different time requirements are served.

Weak Points:

1) No reference is given on user scheduling and energy-efficient resource allocation.
2) The major drawback is that problem formulation and energy-efficient optimization for relay link mode are missing. Only direct link mode without relay capability is discussed. The transmission power of relay stations is not counted into the total transmission power. The energy-efficient optimization algorithms are really simple and traditional. In addition, no clear definition of energy efficiency is given.
3) The simulation results about spectral efficiency of different resource allocation algorithms are needless.
4) Several doubts: Scheduling scheme transfers user information into packet priority queue and resource allocation algorithms allocate resources for packets rather than users. How to ensure the quality of service requirements of different users? The scheduling scheme aims to guarantee fairness and maximize system throughput. Why no energy-efficient factor is considered in the scheduling scheme? Are there trade-offs between energy efficiency and fairness and between energy efficiency and system throughput? How to allocate the remaining sub-carriers? Why does this paper select the spectral-efficient maximization greedy algorithm for comparison with other energy-efficient optimization algorithms? What's the relation between energy-efficient and spectral-efficient?
5) Typos:

Page 3:
(10b)→(5b)
(10c)→(5c)
sub-suction→sub-section

Recommended Changes:

1) Maintain only one main objective throughout a paper!
2) The energy-efficient optimization for relay link should be presented since it's a crucial issue in OFDMA relay networks. The problem of finding the optimal resource allocation to maximize energy efficiency for relay link is much more complex than for direct link. More factors should be considered.
   See for examples:
   Feng-Seng Chu, Kwang-Cheng Chen, "Energy efficient OFDMA: Trade-off between computation and transmission energy"
   Yun Jiang, Jianhua Zhang, Xiaofan Li, Wei Xu, "Energy-Efficient Resource Optimization for Relay-Aided Uplink OFDMA Systems"
   Chieh Yuan Ho, Ching-Yao Huang, "Energy Efficient Subcarrier-Power Allocation and Relay Selection Scheme for OFDMA-Based Cooperative Relay Networks"
   Lin Xiao, Cuthbert L, "Adaptive power allocation scheme for energy efficient OFDMA relay networks"
   Kommate Jitvanichphaibool, Rui Zhang, Ying-Chang Liang, "Optimal Resource Allocation for Two-Way Relay-Assisted OFDMA"
3) A better design of simulation is needed. More parameters such as the number of relay stations per cell and average distance between base stations and relay stations could be studied.
4) In this paper, all relay stations are assumed to be prompt relays, which means when a relay station receives some data for relaying at the first slot, it should schedule to transmit the data out and empty its buffer at the second slot. Obviously, the case of systems with non-prompt relays could be more widely applicable, however it will bring much more complexity. It could be studied in the future.