Joint Power, Original Bandwidth, and Detected Hole Bandwidth Allocation for Multi-Homing Heterogeneous Networks Based on Cognitive Radio

Wang, Xinyu

Jia, Min

Guo, Qing

Ho, Ivan Wang Hei

Wu, Jinsong

In this paper, we investigate a joint resource allocation problem based on cognitive radio (CR) techniques for user equipment with multi-homing capabilities. We consider a heterogeneous wireless medium where users in overlapping coverage areas simultaneously communicate with different base stations and access points. Currently, existing works assume that the working frequency bands of different networks are separated. Unlike these works, this paper focuses on the multi-homing networks, which can share spectrum resources of each other to enhance the resource utilization efficiency. Based on spectrum sensing and spectrum sharing techniques in CR, we propose and then formulate an uplink joint original bandwidth, detected hole bandwidth and power allocation method. Specifically, the formulated optimization problem is a mixed integer nonlinear optimization problem. We adopt the continuity relaxation method to further transform it into a convex optimization problem and then solve it by Lagrange dual solution. A suboptimal method is further proposed with a reduced system overhead. Simulation results demonstrate the significantly improved performance of our proposed methods (both optimal and suboptimal) in terms of system throughput and energy efficiency over a joint resource allocation benchmark. Our results also indicate that the suboptimal strategy can indeed reduce the system overhead remarkably.