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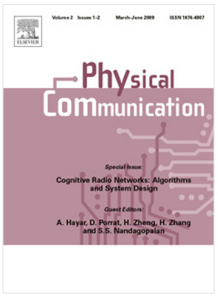

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An Adaptive Step-Size Spectrum Auction Mechanism for Tow-Tier Heterogeneous Networks

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Abstract— Recently, with the rapid growth of demands for wireless communications, dynamic spectrum allocation is one of the key technologies in cognitive radio networks to resolve the realistic problem of low utilization efficiency of spectrum. It mainly focuses on how the spectrum owner dynamically allocates idle spectrum to secondary users who have no licensed spectrum for communications. In this paper, a dynamic spectrum allocation model based on auction theory in a two-tier heterogeneous network is proposed, in which the primary users (PUs) are the sellers, the central processor (CP) auctioneer is the coordinator, and femtocell base station (FBS) as the buyer bids for the idle spectrum and act as a wireless access point that provides communication services for secondary users (SUs). Its basic process is as follows: the auctioneer gradually raises the spectrum price from the reserved price; each bidder decides whether participates in the purchase or not. It is characterized by distributed execution and low complexity which can reduce unnecessary information exchange between primary users or secondary users. Meanwhile it can enhance the utilization of spectrum and improve the efficiency of the auction by generate the incentive mechanism.

Keywords— adaptive step-size, spectrum auction mechanism, dynamic spectrum allocation, cognitive radio, femtocell base station, two-tier heterogeneous network

I. INTRODUCTION

A. Motivation

With the rapidly development of wireless communication technology, especially wireless local area network (WLAN) technology and wireless personal area network (WPAN) technology which would make more and more people can wirelessly access the Internet [1][2]. The technology called Cognitive Radio (CR) [3] allows SUs to access the channel under certain constraints which can effectively improve the spectrum utilization. In the cognitive radio network, primary users (PUs) are the authorized users who have the ownership of the channel and can access it at any time without any restrictions. The secondary users (SUs) are the unauthorized users who can use the channel only in the absence of interference to PUs. If