SPECTRUM SHARING AND COEXISTENCE IN FUTURE WIRELESS NETWORKS

by
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ABSTRACT

With the spectrum resource in wireless networks becoming more congested, spectrum sharing is more crucial to meet the demands of future networks. With the increasing growth of mobile data traffic in the next-generation wireless communications system, capacity maximisation has been a central focus for government, academia and industry. Regulatory bodies have proposed different spectrum sharing techniques to solve the significantly increasing spectrum demand. There are two main spectrum sharing frameworks: Spectrum Access System (SAS) in the U.S. and Licensed Shared Access in Europe. Our work focuses on the SAS in the 3.5 GHz band. SAS is a three-tier spectrum sharing framework proposed by the Federal Communications Commission. The SAS three tiers are Incumbent Access, Priority Access Licensee (PAL) and General Authorised Access (GAA).

The optimal transmit power allocation problem is investigated for GAA users considering the transmission time fraction of GAA users in the SAS. To increase the capacity of GAA users, we consider the transmission time fraction of each GAA user for the transmit power and the channel allocation. Our proposed method finds the optimal channel switching schedule that maximises the average capacity of GAA users while satisfying the interference constraint at the PAL protection area and ensuring the fairness among GAA users.

We have proposed transmit power and channel allocation method that ensures conflict-free co-channel coexistence between PAL and GAA users as well as GAA users in different sets. We proposed the transmit power ad-

justment method using the information of the sets that can hear each other, which maximises the GAA users capacity. For a conflict-free resource allocation to the GAA users, a channel utilisation budget adjustment method is proposed considering GAA users in single and multiple sets.

Furthermore, mobile GAA users are considered in our study which adds an additional challenge to the resource allocation problem. We propose an interfering angle based method for the transmit power allocation for both fixed and mobile GAA users considering the interfering sets of users that are time-varying due to their mobility. Based on the information regarding the overlapping area, the maximum allowed transmit power is proposed for the interfering angle.

The coexistence among GAA users in SAS is a crucial problem to be solved to enhance the system capacity and to meet the increasing traffic demand. In summary, the resource allocation methods are presented in this thesis which contributes to interference protection and capacity maximisation in the Spectrum Access System.

CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Shubhekshya Basnet declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Electrical and Data Engineering at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Signature of Student: Production Note: Signature removed prior to publication.

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To My Parents

Chitra Bahadur Basnet and Indira Basnet.

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Journal publications

- S. Basnet, Y. He, E. Dutkiewicz and B. A. Jayawickrama, "Resource Allocation in Moving and Fixed General Authorized Access Users in Spectrum Access System," *IEEE Access*, vol. 7, pp. 107863-107873, 2019. (Corresponding to Chapter 5)

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