Joint Power and Admission Control Based on Hybrid Users in Cognitive Radio Network

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Joint Power and Admission Control Based on Hybrid Users in Cognitive Radio Network

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Abstract

Hybrid users or primary-secondary users (PSUs) are advanced primary users that are able to access the secondary network using their cognitive functions. Hybrid users can appear as a new type of cognitive users that would be promising for future cognitive radio networks (CRNs). Regarding the unique capabilities of such users and due to the lack of considerable research on this subject, we study the problem of joint power and admission control in spectrum underlay CRN based on hybrid users. In order to fully take the advantages of cognitive capability, an advanced cognitive radio network (ACRN) is proposed by employing the PSUs, and the corresponding power and signal-to-interference-plus-noise ratio (SINR) are derived. Then, feasibility checking mechanism is investigated and the optimal value of interference temperature limit for PSUs is also obtained. A new formulation to maximize the number of admitted secondary users (SUs) in ACRN is presented. Moreover, two power and admission control algorithms are proposed which significantly improve the network performance not only in the number of admitted SUs but also in transmit power consumption. For a feasible network, the problem of aggregate throughput maximization is solved using successive geometric programming. Afterwards, it is proved that our proposed ACRN can improve the aggregate throughput of SUs. The superior efficiency of ACRN in terms of the number of admitted SUs, transmit power consumption and aggregate throughput is verified by simulation results for different scenarios.

Keywords: Cognitive radio network, power and admission control, advanced primary user, spectrum underlay, hybrid user.

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