Joint Beamforming, Channel and Power allocation in Underlay Cognitive Radio Network

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Resource allocation in Cognitive Radio Network (CRN) has been a difficult task to achieve mainly because of the interferences that could happen either at the Primary Use Receiver (PU-RX) or Secondary User Receiver (SU-RX). Previous works have been done in this area to address the problems of channel and power allocations under some interference constraints using Beamforming (BF) techniques with multi-antenna systems [1]. In fact, Zero-Forcing Beamforming (ZFB) was the common choice to null the interferences at the PU-RXs for a specific set of SUs selected by an appropriate user selection algorithm [2].

In this study, we consider a resource allocation problem to maximize the sum-rate of an underlay cognitive radio network. In fact, the BF vectors, power and channel allocation vectors are the main optimization parameters. This is a mixed-integer non-convex NP-hard optimization problem. Hence, the complexity of the problem is high. The proposed solution consists of three sub-problems. During the first sub-problem, BF vectors are calculated by considering the interference tolerance capability of the PU-RXs. Optimal power allocation vector is calculated using the Lagrangian dual method in the second sub-problem [3]. Hungarian algorithm is used to determine the optimal channel allocation in the last sub-problem. In conclusion, this iterative algorithm can achieve a local optimal solution for the sum-rate.

REFERENCES

