Abstract

Cognitive Radio is a key technology that has been proposed to exploits the unused spectrum holes available in the licensed spectrum band. Accuracy of detection of unused holes is the key to the success of Cognitive Radio (CR), which is performed by spectrum sensing operation in Cognitive Radio Network (CRN). CR allows the opportunistic access to these unused spectrum holes provided the licensed users (primary users) are always protected from interference due to CR users (secondary users) transmission. However, issues like shadowing, multipath fading etc. affect performance of spectrum sensing module impacting the detection performance of the secondary users (SUs). Cooperative Spectrum Sensing (CSS) has proven to be an emerging scheme to overcome the above issues of spectrum sensing which significantly improve spectrum sensing performance and quality result utilizing spectral diversity of the SUs.

In this dissertation work, a game theory based coalition model for Cooperative Spectrum Sensing for CRN has been proposed. The major contribution of this work is to accommodate the constraint during cooperation due to the cost of reporting time and reporting energy. A formulation has also been carried out to decide the optimal size of a possible coalition and a scheme for coalition head selection dynamically. Along with the above formulation, the condition to achieve the coalition stability is also carried out for the proposed model. Simulation results have shown that average throughput of a SU within a coalition is better than the throughput of non-cooperative case of the same SU. It has also been found that the formulation of coalition accommodates the tradeoff due to reporting time and reporting energy. It has been shown that the optimal size of coalition varies depending on the variation of the given target probability of false alarm of a coalition. Further, simulation results show the performance enhancement due to selection of the coalition head in accordance to the proposed method derived for head selection in a coalition.

Keywords: Cognitive Radio(CR), Cognitive Radio Network (CRN), licensed user, unlicensed user, primary user (PU), secondary user (SU), and Cooperative Spectrum Sensing (CSS).