Abstract

The problem of spectrum scarcity and inefficient use of spectrum is addressed using cognitive radio technology by exploiting the unused spectrum holes in wireless network opportunistically. However, reduction of interference to primary user (PU), maximizing the throughputand connectivity of secondary users (SU) and providing the quality of service (QoS) are the main challenges in a Cognitive Radio Network (CRN).Motivated by the facts the problem of maximizing the average throughput of theSUs has been addressed provided the interference to the PU remains within the tolerance level of the PU receiver.A technique has been proposed to model the channel sharing problem while optimizingthe throughput of the SUs for an ad-hocunderlay CRN. During the underlay communication, each SU receives a particular signal strength based on its distance from the PU. A HEAD or centralized authority is chosen among the SUs using a technique based on received signal strength values of the SUs.The HEAD collects the information from all the other SUs in terms of data rate requirement, interference produced to PU and the SNR levelof the SUs through a common control channel.Using the received information a model is formulated based on dynamic programming,which proposes to decide which SUs can be selected to access a channel for underlay mode communication. A channel is allowed to be accessed such that the average throughput is maximizedwhile the overall interference to the PU receiveris minimized.The proposed model allows the HEAD or centralized authority to dynamically assign the channel among the selected SUs, provided their requirement for communication is satisfied.

The working of the proposed modelhas been testedby means of numerical evaluation and simulation study.For the simulation purpose, a greedy algorithm has also been formulated which selects the SUs based on their data rate to interference ratio. The simulation has been performed comparing the results of the proposed model against the greedy approach.The resultshows that the proposed model outperforms the greedy algorithm. Furthermore, simulation results also show that in worst case scenario the proposed model performs better than the greedy approach in terms of improving theoverall connectivity in the network.

Keywords: Cognitive Radio Network (CRN), received signal strength, quality of service (QoS), primary user (PU), secondary user (SU),interference, interference tolerance level, signal to noise ratio (SNR) and data rate (DR).