Energy Efficient Spectrum Access in Cognitive Wireless Access Networks

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Abstract:

It is estimated by 2020 the traffic in wireless access networks will increase drastically as compared to the 2010 level. To meet this challenge, it needs the huge increase of spectrum, very high spectrum efficiency, dense deployment of small cells, and highly energy efficient solutions. Combining those together, we believe the cognitive wireless access network would be a promising solution. In this paper, we study the energy efficient spectrum access problem in dynamic spectrum access (DSA) based wireless access networks, in which densely deployed access points (AP) provide open access to mobile terminals (MT) by spectrum opportunities enabled by primary users (PU). The question is how the spectrum is allocated to MT via AP so that the bit/energy to deliver the data is maximized. We separate the problem into the channel selection problem of AP and the AP association problem of MT, and propose the distributed AP channel selection algorithm and MT association algorithm, which are run on the AP and MT separately, with a joint goal to improve the bit/energy delivery by the efficient use of spectrum. The proposed algorithms only rely on local information exchange to estimate inter-cell interference, and are therefore scalable to large networks. The performance of the proposed algorithms are evaluated by simulation. It shows in average around 10% bit/energy improvement over the algorithms which randomly allocate channels and associate MTs.