Optimal Switching in Cognitive Radio Networks

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Abstract

We consider a Cognitive Radio Network having N Primary Users (PUs) and one Secondary User (SU). We are investigating the problem of channel switching, which incurs a reconfiguration delay. The SU, in this problem, performs a wide band sensing of all channels, and based on sensing outcomes and most recently accessed channel, it decides *whether to switch and access* the different channel *or remain silent* in the same channel. When the SU decides to switch, it experiences reconfiguration delay, where the fraction of time–slot is needed for switching and the remaining portion is available for SU's transmission. Furthermore, we investigate the problem of channel switching in the perspective of energy efficiency because the SU, a battery-powered device, requires significant amount of energy for switching. At the beginning of each time–slot, the SU merely senses one channel, m, and makes the following decision: *(i) whether or not to access the channel* m. *(ii) which channel to sense for the next time–slot.* We consider an imperfect sensing model that takes into account false alarm and detection probabilities. We show that the problems can be posed in the framework of Partially Observable Markov Decision Process (POMDP), and obtain the optimal policies for which we provide structural results. Also, we propose a low complex algorithms ASTUTE and EFFICACY for channel sensing and access based on one stage reward.