

In TV White Space, the unlicensed users are required to periodically access a database to acquire information on the spectrum usage of the licensed users. In addition, the unlicensed users can access the database on-demand, whenever they believe convenient, to update the spectrum availability information. In this paper, we design the optimal database access strategy, i.e., the strategy allowing the unlicensed users to jointly: (1) maximize the expected overall communication opportunities through on-demand accesses; and (2) respect the regulatory specifications. To this aim, we develop a stochastic analytical framework that allows us to account for: (1) the PU activity dynamics; (2) the quality dynamics among the different channels; and (3) the overhead induced by the database access. Specifically, at first, we prove that the database access problem can be modeled as a Markov decision process, and we show that it cannot be solved through brute-force search. Then, we prove that the optimal strategy exhibits a threshold structure, and we exploit this threshold property to design an algorithm able to efficiently compute the optimal strategy. The analytical results are finally validated through simulations.