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Combined pre-detection and sleeping for energy-efficient spectrum sensing in cognitive radio networks

Yuan Gao, Zhixiang Deng, Dongmin Choi, Chang Choi

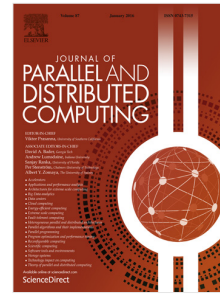
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Highlights

To solve the problem of a high sleeping rate leading to the extension of the sensing duration, we designed a pre-detection sub-phase embedded at the beginning of the detection phase, where all SUs participate in the detection of the presence of PUs for a fixed time duration. It follows that, if all the SUs participate in detection for a fixed time duration to ensure the detection results obtained by the SUs are reliable, the detection performance is not affected by a high sleeping rate, and it is thus unnecessary to extend the sensing duration.

The proposed scheme saves transmission energy in the reporting phase without employing the common control channel (CCC). The CCC occupies additional spectrum resources and this introduces an additional complexity into the CCC management. The proposed scheme applies a sleeping mechanism in each SU in the reporting phase to reduce the transmission energy and uses a detected spectrum hole to transmit the local detection results.

In contrast to the existing models, where Gaussian detection and reporting channels are assumed, we derive an analytical framework based on Rayleigh fading detection and reporting channels.

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