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COOPERATIVE SPECTRUM SENSING AND RADIO ENVIRONMENT MAP CONSTRUCTION IN COGNITIVE RADIO NETWORKS

In this thesis, we focus on both internal and external sensing in Cognitive Radio (CR) networks. In internal sensing, individual CRs discover spectrum opportunities via spectrum sensing whereas in external sensing, an external entity provides the spectrum occupancy and related information. For the first, we propose a novel cooperative spectrum sensing scheme, Uniform Quantization-based Cooperative Sensing (UniQCS) that uses uniform quantization and an effective fusion strategy. Numerical results demonstrate that under imperfect reporting channel and false reports, UniQCS performs better than hard decision algorithms such as Majority and M-of-N in terms of probability of detection and false alarm at the expense of a marginal increase in overhead bits. We demonstrate that the performance of UniQCS is very close to that of equal gain combiner, which constitutes the upper bound for the decision performance.

Due to the challenges in internal sensing, external sensing recently has gained noticeable interest. In external sensing, CRs access spectrum through geolocation databases, which keep relatively static information. Radio Environment Map (REM) is a kind of improved geolocation database and an emerging topic with the latest regulations on TV white space communications. It constructs a signal power temperature map of the CR operation area via processing spectrum measurements collected from sensors dynamically. In this thesis, transmitter Location Estimation based (LIVE) REM construction technique is proposed and compared with the well-known REM construction techniques in shadow and multipath fading channels. The simulation results suggest that the LIVE REM construction outperforms the compared methods in terms of root mean square error and correct detection zone ratio.

PUBLICATIONS

Journals

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- 4) D. Cavdar, **H. B. Yilmaz**, T. Tugcu, and F. Alagöz, "Analytical modeling and resource planning for cognitive radio systems," *Wireless Communications and Mobile Computing*, 2009.
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- 1) C. Altay, **H. B. Yilmaz**, and T. Tugcu, "Cooperative Sensing Analysis under Imperfect Reporting Channel," in Proc. IEEE 17th International Symposium on Computers and Communication, (**ISCC**) **Best Paper Award**, 2012.
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