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Hager S. Fouda, Amr H. Hussein, Mahmoud A. Attia

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# Efficient GLRT/DOA spectrum sensing algorithm for single primary user detection in cognitive radio systems

Hager S. Fouda*, Amr H. Hussein, Mahmoud A. Attia

Department of Electronics and Electrical Communicaton Engineering, Faculty of Engineering, Tanta University, Tanta, Egypt.

**Abstract**

**Spectrum sensing is a fundamental requirement for cognitive radio systems. In this paper, a new spectrum sensing technique with multiple antenna elements is proposed for further performance enhancement. The proposed technique is based on direction of arrival (DOA) knowledge and beamforming of the received signals. In this context, the Signal to Noise Ratio (SNR) will be significantly improved. The proposed technique is developed to detect only one primary user. Test statistics which determine the absence/presence of the Primary User (PU) are derived by using generalized likelihood ratio test (GLRT) approach. Two test statistics are developed with and without prior knowledge of noise power. Theoretical analysis for probability of detection, probability of false alarm, and their associated threshold are performed based on the statistical theory. Under a few samples scenario, simulations revealed that the proposed technique outperforms the other existing techniques particularly at low SNR regimes. In addition, it consumed less sensing time. Further, simulation results have confirmed theoretical analysis.**

*Keywords:* Cognitive radio; spectrum sensing; generalized likelihood ratio test; uniform linear array; direction of arrival.