论文

一种新型的基于最大特征值的合作频谱感知算法

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A Novel Cooperative Spectrum Sensing Algorithm Based on the Maximum Eigenvalue

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摘要 针对认知无线电中经典频谱感知方法的缺点，该文利用随机矩阵理论的相关研究成果，提出了一种基于采样协方差矩阵最大特征值与平均能量的合作频谱感知新算法。该算法将次用户接收信号协方差矩阵的最大特征值与接收信号平均能量的比值(Maximum Eigenvalue-Energy Detection, ME-ED)作为统计判决量，以此判决出主用户是否存在，从而实现频谱感知功能。理论分析表明，与经典频谱感知方法相比，ME-ED算法无需知晓主用户信号的任何先验知识及噪声功率。仿真结果显示，与MED算法和ED方法相比，该算法不仅对噪声的不确定性不敏感，而且在噪声存在波动的情况下，其感知性能最优，鲁棒性最强。

关键词： 认知无线电 合作频谱感知 随机矩阵理论 采样协方差矩阵 最大特征值

Abstract： In order to overcome the disadvantages of the traditional spectrum sensing methods in Cognitive Radio (CR), a novel cooperative sensing algorithm based on the maximum eigenvalue and average energy of the received signal covariance matrix is presented in this paper. The proposed algorithm exploits the ratio of the Maximum Eigenvalue to Energy Detection (ME-ED) to determine whether the Primary User (PU) is present or not. Through the theoretical analysis, ME-ED scheme can work well without the knowledge of the PU signal and the noise power. In addition, simulations show ME-ED is not sensitive to noise uncertainty, and can obtain the optimal sensing performance and the strongest robustness under the noise uncertainty compared to MED and ED.

Keywords： Cognitive Radio (CR)   Cooperative spectrum sensing   Random matrix theory   Sample covariance matrix   Maximum Eigenvalue (ME)

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