

应用

基于OMP算法的宽带频谱感知

赵知劲, 张鹏, 尚俊娜, 王海泉

杭州电子科技大学 通信工程学院; 中国电子科技集团第36研究所通信系统信息控制技术国家级重点实验室

摘要:

频谱感知是认知无线电的一项关键技术, 其能够检测出未被主用户占用的频谱空穴供次用户接入使用, 提高频谱利用率。宽带频谱感知要求对数GHz的带宽进行检测, 过高的采样速率、大的数据量对现有的硬件设备提出了巨大的挑战。本文利用宽带频谱的稀疏性提出一种基于OMP算法的宽带频谱感知方法。该方法利用MWC采样实现对宽带模拟信号直接压缩采样; 利用自相关矩阵对称分解特性和主用户信号独立性, 得到有限维压缩采样信号模型, 利用AIC/MDL准则估计稀疏度作为OMP算法迭代停止的条件, 大大减少了算法复杂度; 该方法不需要重构接收信号的PSD, 直接在时域根据低速率采样信号, 检测被占用信道。仿真结果表明, 当带内信噪比大于9dB时, 频谱检测概率高于90%。

关键词: 宽带频谱感知; 压缩感知; MWC采样; OMP算法; AIC/MDL准则; 认知无线电

Wideband Spectrum Sensing Based on OMP Algorithm

ZHAO Zhi-Jin, ZHANG Peng, SHANG Jun-Na, WANG Hai-Quan

School of Telecommunication Engineering of Hangzhou Dianzi University; State Key Lab of Information Control Technology in Communication System of No.36 Research Institute, China Electronic Technology Corporation

Abstract:

Spectrum sensing is the key technology in cognitive radio field. This technology is enable the secondary users to detect the underutilized spectrums "white space" which have not been occupied by the primary users, improving the spectrum efficiency of the whole system. Wideband spectrum sensing requires several GHz bandwidth sensing. Excessively high sampling frequency and large amount of data are the major challenge for existing hardware devices. By utilizing the sparsity of wideband spectrum, this paper proposes a new spectrum sensing method based on OMP algorithm for wideband spectrum sensing. In the proposed method, MWC sampling is used to implement compress sampling for the wideband analog signal directly. The compression sample model with finite dimension is obtained by using the symmetry decomposition property of autocorrelation matrix and the independence of the primary user's signal. Besides, AIC/MDL criteria is used to estimate the sparsity which is a threshold of the stop iteration for the OMP algorithm. As a result, the complexity of the algorithm is reduce greatly. The estimation of the signal's PSD is skipped in our method. The occupied channels are detected directly from the compress sampled data in time domain at low rates. Simulation results show that when the in-band SNR is above 9dB, the spectrum detection probability is greater than 90%.

Keywords: Wideband spectrum sensing Compressed sensing MWC sampling OMP algorithm AIC/MDL criteria Cognitive radio

收稿日期 2011-11-08 修回日期 2012-03-28 网络版发布日期 2012-05-25

DOI:

基金项目:

通讯作者:

作者简介:

作者Email: zhaozj03@hdu.edu.cn

参考文献:

本刊中的类似文章

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(706KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 宽带频谱感知; 压缩感知;
- ▶ MWC采样; OMP算法;
- ▶ AIC/MDL准则; 认知无线电

本文作者相关文章

- ▶ 赵知劲
- ▶ 张鹏
- ▶ 尚俊娜
- ▶ 王海泉

PubMed

- ▶ Article by Diao, Z. J.
- ▶ Article by Zhang, F.
- ▶ Article by Chang, D. N.
- ▶ Article by Wang, H. Q.

反馈人	<input type="text"/>	邮箱地址	<input type="text"/>
反馈标题	<input type="text"/>	验证码	<input type="text" value="2555"/>