

短文与研究通讯

LCL-FRESH滤波器实现单通道盲源分离

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摘要:

在无线频谱检测及军事侦察的接收机中存在时频重叠信号,利用时频域滤波及常规盲源分离方法很难实现该信号的分离和信息提取。针对此问题,本文根据单通道时频重叠调制信号在循环谱域具有独立性和稀疏性的特点,提出了一种通过循环谱域滤波器来实现两路源信号分离的方法:采用周期图法对一调制信号进行循环谱估计,得到该调制信号具有最强谱相关特性的循环频率点 $\theta$ ;再将 $\theta$ 作为LCL-FRESH滤波器的频移量从单通道时频重叠信号中提取出具有该循环频率的调制信号。最后,在MATLAB环境下对混有白噪声的QPSK和BPSK两路时频重叠信号进行仿真验证,结果表明该方法可有效分离出两路源信号。

关键词: 线性共轭线性频移滤波器; 周期图; 盲源分离

Single-channel Blind Source Separation Achieved by the LCL-FRESH Filter

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Abstract:

Abstract: Time-frequency overlapped signals existing in the wireless spectrum detection and military reconnaissance receiver, which are difficult to be separated and extracted information by using the time-frequency domain filter and conventional blind source separation method. According to the independence and sparsity of single-channel time-frequency overlapped modulation signal in cyclic spectral domain, a new method is proposed to achieve two source signals separation through the cyclic spectrum domain filter in this paper. This method can be stated as follows: Firstly, the cyclic frequency  $\theta$  is found through the cyclic frequency estimation by the periodogram, where the modulated signal has the maximum spectral correlation, using  $\theta$  as frequency shift of the LCL-FRESH filter, the modulated signals with the cyclic frequency are extracted from single-channel time-frequency overlapped signal by a filter. Then, time-frequency overlapped QPSK/ BPSK signal adding white noise is simulated in the MATLAB environment. The result indicates that the two source signals can be separated effectively with this method.

Keywords: Linear-Conjugate-Linear frequency Shift filter Periodogram Blind source separation

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