

短文与研究通讯

基于循环平稳性的CPM信号调制阶数盲识别算法

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摘要:

为了有效估计多进制CPM信号的调制阶数, 本文提出了一种基于循环平稳性和非线性变换的新方法。根据循环平稳的有关理论, 通信信号的非线性变换频谱中存在体现信号各阶循环平稳性的离散谱线, 谱线位置对应着信号载波频率与符号速率的线性组合, 提取这些谱线可以完成信号一些基本参数的估计。本文在分析与推导多进制CPM信号一阶循环矩简化表达式的基础上, 研究了与调制阶数有关的谱线特征, 并给出了算法步骤。实验结果证实了理论分析的正确性, 并且表明, 较已有方法, 本文算法无需知道符号周期, 计算复杂度更低, 受噪声影响小, 在高斯白噪声条件下, 对任意频率成型脉冲的单指数CPM信号都能实现调制阶数有效识别。

关键词: 盲识别; 连续相位调制; 调制阶数; 循环平稳; 循环矩; 非线性变换

A Novel Blind Identification Algorithm for the Modulation Order of CPM Signals Based on Cyclostationarity

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Abstract:

Based on the study of cyclostationarity and nonlinear transform of multilevel CPM signals, in this paper a novel blind identification algorithm is proposed to estimate modulation order. According to the theory of cyclostationary, some discrete spectral lines, located in the linear combination of communication signals' carrier frequencies and symbol rates, are present in nonlinear transform of the signals. Some basic parameters can be estimated by extracting the spectral lines of the nonlinear transform. After the analysis and derivation of a simplified expression for the first order cyclic moment of CPM signals, the spectral lines feature related with modulation order is investigated, followed by the algorithm steps. The experimental results sustain our theoretical analysis and indicate that the proposed algorithm with lower computational complexity, is independent of symbol period and insensitive to noise, compared with the existing algorithm. This method can be used to accomplish effective parameters estimation of single-h CPM signals with any Frequency-Shaping Pulse in the AWGN channels.

Keywords: blind identification continuous phase modulation(CPM) modulation order cyclostationary cyclic moment nonlinear transform

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