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改进的循环谱估计快速算法与性能分析

崔伟亮*　江桦　李剑强　吴楚*

解放军信息工程大学 郑州 450002

Improved Fast Cyclic Spectral Estimation Algorithm and Performance Analysis

Cui Wei-liang　Jiang Hua　Li Jian-qiang　Wu Chu*

PLA Information Engineering University, Zhengzhou 450002, China

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摘要 该文提出了一种改进的循环谱估计快速算法，在估计性能不降低的条件下，减小了原有数字化频域平滑谱估计算法对数据量的要求。算法将时域平滑算法中数据加窗、重叠等处理方法引入频域算法，有效降低了估计方差，改善循环谱的估计效果。论文对改进算法渐进性均值、方差、谱分辨率的表达式进行推导。理论与实验结果分析表明：在相同数据量和谱估计分辨率的条件下，改进方法估计性能优于原算法，可用于实际低信噪比、小数据量、高分辨率要求下循环谱估计。

关键词： 信号处理　循环谱切片　渐近性能分析　估计方差　计算复杂度

Abstract：　An improved fast algorithm is proposed for cyclic spectral estimation, which decreases the requirement of data quantity, without reducing the performance. The windowed overlapped data processing, which is used in time smooth method, is introduced into the frequency smooth algorithm to cut down the original cyclic spectral estimation variance and improve the estimation quality. The paper deduces the estimator's asymptotically expressions of mean, variance, resolution and computational complexity. The theoretical analysis and simulation results prove that the improved algorithm displays better performance than DFSM under the same conditions. The new method is an efficient estimator of cyclic spectrum in the low SNR, high resolution demanding and small data quantity environment.

Keywords：　Signal processing　Cyclic spectral slice　Gradual performance analysis　Estimation variance　Computational complexity

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