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## 基于自适应步长选择的周期格型线搜索估计

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### Period Estimation via Lattice Line Search with Adaptive Step-size Selection

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摘要

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**摘要** 稀疏、含噪观测条件下周期点过程的周期估计是一个经典的信号处理问题。针对该问题,提出了一种格型线搜索(LLS)算法,该算法通过数值方式搜索似然函数的最大值,但其性能取决于人为预先选取的搜索步长。推导了一个步长计算公式,并利用该公式改进了LLS算法。改进的LLS算法能够自适应选择搜索步长,其达到的克拉美-罗界(CRLB)的信噪比(SNR)门限与最大似然估计(MLE)算法一致,但计算复杂度比后者低一个多的数量级。性能分析与仿真实验表明,所提算法比已有算法能更好地实现估计精度与复杂度的折中。

**关键词:** 周期估计 周期点过程 格型 搜索步长 脉冲重复周期

**Abstract:** A lattice line search (LLS) algorithm is employed to estimate the period of a periodic point process when the observations are sparse and noisy. However, the algorithm involves a numerical search for the maximum of the likelihood function which is previously identified, and the chosen step-size affects estimation performance. This paper focuses on the issue of step-size determination, for which a formula is developed. By using that formula, the LLS algorithm is modified to be able to adaptively determine a suitable step-size from the observation data. Compared with the maximum likelihood estimator (MLE), the modified algorithm can attain the Cramer-Rao lower bound (CRLB) at the same signal-to-noise ratio (SNR) threshold, but its computational complexity is lower by more than one order. Performance analysis and simulations show that the proposed estimator can achieve a better tradeoff between estimation accuracy and computational complexity than do the existing estimators.

**Keywords:** period estimation periodic point process lattice step-size pulse repetition interval

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