

算法研究

基于Laurent分解的多指数CPM低复杂度序列检测算法

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摘要:

针对现有的多指数连续相位调制(CPM)信号解调中存在的运算量大, 工程实现难度高等问题, 本文提出了一种基于Laurent分解的低复杂度序列检测算法。该算法采用两个近似处理过程来有效减少解调中所使用的匹配滤波器的个数以及维特比译码器中所使用的网格状态数, 并结合基于判决反馈的减少状态序列检测(RSSD)算法进一步减少后端处理中使用的网格状态。为了估计本文提出的接收机的性能, 把该算法应用到一个实际中使用的多指数调制方案。仿真结果给出了与传统的最大似然序列检测(MLSD)相比, 该调制方案中译码器的网格状态数从32个减少到4个, 匹配滤波器的数目从8个减少到2个, 然而仅仅带来0.9dB的性能损失。表明该算法能有效的降低多指数CPM接收机的复杂度, 适合于实际应用。

关键词: 多指数连续相位调制; Laurent分解; 最大似然序列检测(MLSD); 减少状态序列检测(RSSD)算法; 路径度量

A Low-Complexity Sequence Detection Algorithm Based on Laurent Decomposition for Multi-h Continuous Phase Modulation

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Abstract:

Aiming at the deficiency of the present algorithms of demodulation for multi-h continuous phase modulation (CPM), such as large amount of computation and engineering issues to achieve high degree of difficulty, a low-complexity sequence detection algorithm based on Laurent decomposition for multi-h continuous phase modulation signals is presented. Two approximate processes are used to reduce the number of matched filters and the number of states in Viterbi decoder, combined with reduced state sequence detection (RSSD) algorithm with decision feedback to further reduce the number of states in the back-end state trellis processing. To estimate the performance of the proposed receiver, this algorithm is applied to a practical application of the multi-h modulation scheme. Simulation results show the number of trellis states is reduced from 32 to 4, and the number of matched filters is reduced from 8 to 2 by using the algorithm. However, only 0.9 dB performance loss is caused compared with the corresponding traditional optimum maximum likelihood sequence detection (MLSD) algorithm in this instance. So we can see that the algorithm can reduce the computational complexity of the multi-h continuous phase modulation receiver very efficiently, and it is much easier to implement and more suitable for practical application.

Keywords: multi-h continuous phase modulation Laurent decomposition MLSD RSSD algorithm path metric

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