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基于MMSE的近似最优Lattice Reduction辅助线性并行检测算法

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A Near-optimal Lattice Reduction Aided Linear Parallel Detection Algorithm Based on MMSE

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摘要

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摘要

现有基于Lattice Reduction (LR)技术的多输入多输出(MIMO)系统检测算法,虽然可以有效地提高MIMO系统的误比特率(BER)性能,但其检测性能与最优的最大似然(ML)算法相比仍然存在差距。针对这一问题,提出了一种新的基于信道分组的线性Lattice Reduction辅助检测算法。该算法首先将信道分为两组,对通过条件最差子信道的信号采用最优的ML算法检测,然后将其从接收到的信号中消除,再采用Lattice Reduction技术对第2组信道进行优化,最终并行地对剩余信号进行检测。仿真结果表明:在16QAM(Quadrature Amplitude Modulation)和64QAM调制下,对于4×4的MIMO系统,该算法的误比特率性能达到了最优;对于6×6的MIMO系统,该算法相比最优的ML算法其检测性能相差不到0.5 dB。

关键词: 多输入多输出系统 Lattice Reduction 最小均方误差 线性 并行

Abstract:

Existing multiple-input multiple-output (MIMO) detection algorithms based on Lattice Reduction (LR) can effectively improve the bit error rate (BER) performance. However, these detection algorithms have a large signal to noise ratio (SNR) gap when compared with the optimal maximum likelihood (ML) algorithm. In order to solve this problem, a new Lattice Reduction aided detection algorithm based on channel partition is proposed in this paper. In this algorithm, the signals through the worse conditional sub-channels are first detected with an ML algorithm. After cancelling the impact of these signals, the remaining are detected in parallel with the optimized sub-channels using Lattice Reduction. The simulation results show that, under 16QAM (Quadrature Amplitude Modulation) and 64QAM, the BER performance of the proposed algorithm can achieve the optimal result for a 4×4 MIMO system and have less than 0.5 dB SNR gap as compared with the ML algorithm for a 6×6 MIMO system.

Keywords: MIMO system Lattice Reduction minimum mean square error linearity parallel

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