

一种上行链路大规模 MIMO 系统的低复杂度检测算法

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摘要: 提出了一种适用于上行链路大规模 MIMO 系统的基于 Kaczmarz 算法的低复杂度检测算法. 通过将 MMSE 检测算法转化成等效的增广矩阵的形式, 提出的算法同时避免了直接矩阵求逆和 Gram 矩阵求解. 此外, 一种算法初始值的估计方法和近似的软判决信息计算方法也被提出用于进一步降低算法复杂度. 仿真结果表明该算法在性能和计算复杂度方面优于近期文献中的算法. 同时, FPGA 的验证结果也表明提出的算法能以更低的硬件资源消耗完成大规模 MIMO 系统的检测.

关键词: 大规模 MIMO; 信号检测; Kaczmarz 算法; MMSE

A Low-complexity Signal Detection Algorithm for Uplink Massive MIMO Systems

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Abstract: A low-complexity signal detection approach based on Kaczmarz algorithm is proposed to iteratively realize MMSE detection for uplink massive MIMO systems. By applying an equivalent augmented matrix in MMSE detection, the proposed algorithm avoid the exact matrix inversion and Gram matrix computation. Moreover, promising initial estimation and an approximate method to compute soft-output information is utilized to further reduce the complexity. Simulation results demonstrate that the proposed approach outperforms recently proposed algorithms in complexity and performance. Meanwhile, the FPGA implementation results verify that our proposed method can efficiently compute the approximate inverse with low complexity.

Key words: massive MIMO; signal detection; Kaczmarz algorithm; MMSE

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