MIMO系统中的低复杂度迭代树搜索算法

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摘要　　提出了应用于Turbo-MIMO系统的基于比特的迭代树搜索检测算法．利用自然二进制映射和扩展信道矩阵的QR分解，使迭代树搜索算法(ITS)中的度量计算转换为逐比特进行，这样大大减小了树中每层需要进行的度量更新和排序的运算量．在此基础上，再利用先验信息进一步减小度量更新的计算量．由于扩展信道矩阵的秩等于发射天线数，该算法对信道缺秩的情况不敏感．仿真结果表明：在误码率性能上，该算法略次于使用自然二进制映射的基于符号的ITS算法，与使用格雷映射的基于符号的ITS算法只有1dB左右的差距；而该算法的计算量在高信噪比时只相当于基于符号的ITS算法的6%～40%．

关键词　　多输入多输出(MIMO)系统　迭代检测解码　树搜索算法

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Low complexity iterative tree search detection for MIMO systems

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Abstract

<P>This paper presents a low complexity bit-level iterative tree search (ITS) detector for Turbo-MIMO wireless communication systems. When combining natural binary bit mapping and QR decomposition on the augmented channel matrix with the symbol-level ITS, we get a bit-level ITS algorithm. In this algorithm the metric is computed in a bit-by-bit fashion. In this way the computational complexity of metric updating and sorting can be greatly reduced. Based on the bit-level ITS, the complexity can be further reduced using the a priori information from the decoder. Because the rank of the augmented channel matrix is always equal to the number of transmitting antennas, the algorithm can work well in an ill-conditioned channel. Simulation shows that the proposed algorithm can achieve similar performance to that of the ITS using natural binary bit mapping and has about 1dB gap with the ITS using Gray bit mapping. In the high SNR region, the complexity of the proposed bit-level ITS is about 6%～40% of the symbol-level ITS.
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Key words　MIMO　iterative detection and decoding　tree searching algorithm

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