

电子技术

基于不完美信道估计的闭环MIMO-MRC跨层设计

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摘要:

为提高无线通信网络的频谱效率, 提出了一种MIMO-MRC(multiple-input multiple-output-maximal ratio combining)跨层设计方案。该方案是联合物理层的自适应调制技术(adaptive modulation, AM)和数据链路层的自动重传技术(automatic repeat request, ARQ)交互协作, 发射端利用估计信道信息反馈, 自适应调节调制模式, 选择最优发射权矢量和自动重传发射数据。分析了估计误差对MIMO-MRC跨层系统的影响, 给出了MIMO-MRC系统在信道估计存在误差时的频谱效率和中断概率的闭合表达式。通过仿真实验证明, 对比SISO(single-input single-output)跨层系统和Alamouti's跨层系统, MIMO-MRC跨层系统的性能有明显提高, 可获得约3 dB的分集增益。

关键词: 跨层设计 自适应调制 自动重传 最大比合并 不完美信道估计

Closed-loop MIMO-MRC cross-layer design scheme based on imperfect channel estimation information

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Abstract:

To improve wireless communication network's spectral efficiencies, a MIMO-MRC cross-layer design scheme is proposed. The scheme is scheduled through combining multi-level adaptive modulation at physical layer with automatic repeat request protocol at data link layer. By utilizing channel state information and automatic repeat request which is fed back by the receiver, the transmitter updates the modulation mode adaptively, chooses the optimal transmitter beam-steering vector and retransmits data automatically. The effects of estimation errors on the system's performance gains are analyzed and the close-form expressions of the system for spectral efficiencies and the probability of outage with imperfect channel estimation information are presented. The simulation results show that compared with the SISO cross-layer system and Alamouti's cross-layer system, the performance of the MIMO-MRC cross-layer system is observably superior and achieves almost a diversity gain of 3 dB.

Keywords: cross-layer design adaptive modulation (AM) automatic repeat request(ARQ) maximal ratio combining (MRC) imperfect channel estimation

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