

论文与技术报告

多小区MIMO系统中基于泄漏的多用户下行链路预编码新算法

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摘要:

针对多小区MIMO系统的多用户下行链路预编码设计是未来移动通信系统研究的重要内容之一。本文在蜂窝多小区MIMO通信环境下, 基于信漏噪声比(Signal-to-Leakage-Noise Ratio, SLNR)最大准则, 提出了改进的多用户下行链路线性预编码算法。通过在优化目标中考虑接收端白化滤波器的影响, 该预编码算法实现了对用户间干扰和小区间干扰(OCI)的同步抑制消除; 在求解预编码矩阵优化问题时, 本文基于QR分解提出了一种新的低复杂度求解算法, 该算法能以较低的计算复杂度实现系统性能的有效提升。仿真实验结果表明, 本文的改进SLNR线性预编码算法能有效抑制小区间干扰(OCI)的影响, 使多小区MIMO系统获得更高的和速率(Sum Rate)容量。

关键词: 多小区; 小区间干扰(OCI); 多用户多输入多输出(MIMO); 预编码; 信漏噪声比(SLNR)

A Novel Leakage-based Precoding Scheme for Multi-cell Multi-user MIMO System Downlink

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Abstract:

In future wireless cellular system, full frequency reuse is beneficial for higher spectrum efficiency. However, the co-channel interference (CCI) between the cells constrains the system performance seriously. Therefore, precoder design for multi-cell multi-user MIMO system downlink becomes an important part of the research on future mobile communication systems. In this paper, an improved precoding scheme based on signal-to-Leakage-Noise Ratio (SLNR) maximization is proposed for the downlink of multi-cell multi-user MIMO system. In this scheme, whitening filter is used at each receiver for other-cell interference (OCI) suppression, and the influence of whitening filter is considered at the transmitter for precoder design. This proposed precoding scheme can therefore eliminate the multi-user interference (MUI) and the whitened other-cell interference (OCI) simultaneously. Furthermore, a novel QR-decomposition-based algorithm is derived to find the optimized precoding matrix for each user. Using this proposed SLNR precoding scheme, the system sum rate capacity is improved significantly with lower computational loads. Simulation results demonstrate that the proposed SLNR precoding scheme can suppress the impact of the other-cell interference (OCI) efficiently, and is more suitable for multi-cell MIMO communication systems.

Keywords: Multi-cell Other-cell interference (OCI) Multi-user Multi-input Multi-output (MIMO) precoding Signal-to-leakage-noise ratio (SLNR)

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