

算法研究

OFDMA中继通信系统中非对称的资源分配

陈瑾平, 杨绿溪

东南大学信息科学与工程学院

摘要:

传统的OFDMA协作通信系统, 中继经过一一对应的两跳子载波接收和发送数据信息, 这一对称的资源分配模式限制了系统吞吐量的提高; 本文放宽对称约束, 研究了非对称模式下的资源分配问题。自由度的增加, 增大了系统资源分配的复杂度, 这是一个结合中继选择、子载波分配和功率控制等多维自由度的混合离散型优化问题, 很难得到满足实时性要求的近似最优算法。针对该模型, 本文提出基于拉格朗日松弛的联合优化算法, 算法的关键在于OFDMA系统的渐进强对偶性, 这个性质使得多项式时间算法的设计成为可能。算法的复杂度与子载波数目成线性关系。仿真结果表明, 该算法的性能是近似最优的, 而且与对称模式相比, 非对称模式下的资源分配进一步提升了系统的吞吐量性能。

关键词: OFDMA; 中继; 非对称; 资源分配; 近似最优

Asymmetric Resource Allocation in OFDMA-Based Relay Systems

CHEN Jin-Ping, YANG Lu-Xi

School of Information Science and Engineering, Southeast University, Nanjing

Abstract:

In the traditional OFDMA (orthogonal frequency division multiple access) cooperative systems, the bits received by the relay on one dedicated subcarrier are retransmitted to the destination over paired subcarrier. However, this is not optimal in terms of system performance. This paper relaxes the constraint and designs asymmetric resource allocation. This increases the degree of freedom for transmission. The joint optimization problem of relay selection, subcarrier assignment and power control with the objective of maximizing the transmission rate is a mixed discrete programming problem which is hard to tackle efficiently and near optimally. We develop the method based by Lagrangian dual relaxation to solve this problem efficiently. The key in the algorithm is the so-called asymptotic strong duality for OFDMA systems. The asymptotic strong duality suggests that it may be possible to devise polynomial time approximation scheme. The computation complexity is linear with the number of subcarriers. Simulation results show the proposed scheme achieves a higher system capacity than existing symmetric resource allocation schemes, and near-optimal to the globally optimal solution.

Keywords: OFDMA Relay Asymmetric Resource allocation; Near-optimal

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通讯作者:

作者简介:

作者Email: ddmbrsr@sina.com

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