

论文与技术报告

OFDMA系统基于QoS保证和最大最小公平性准则下的动态资源分配

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摘要:

正交频分多址(OFDMA)技术以其更高的频谱效率和抗多径衰落特性成为高速无线通信网络的候选标准。兼顾效率和公平性是OFDMA系统资源分配亟待解决的问题。本文研究了OFDMA系统中的无线资源分配问题,既要保证QoS用户的最小速率要求,同时“尽力而为”用户之间必须满足最小速率最大化公平性(max-min fairness)准则;该资源分配问题可以表述为一个系统总功率约束下的子载波分配和功率控制的混合离散型优化模型,这是难解的NP-hard问题,穷举搜索的代价是极其巨大的。针对该非凸模型,本文设计一个拉格朗日松弛的优化算法,该算法中采用修正的椭圆算法求解对偶问题。算法具有多项式时间复杂度,且与子载波数目呈线性增长关系。仿真结果表明,该算法能近似最优地满足用户QoS及最大最小公平性要求。

关键词: 正交频分多址 服务质量 最大最小公平性 资源分配

Dynamic Resource Allocation for QoS-aware OFDMA Systems with Max-min Fairness Constraint

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Abstract:

Orthogonal frequency division multiple access (OFDMA) is a promising candidate for high-speed wireless communication networks, due to its high spectral efficiency and resistance to multipath fading. Fairness and efficiency are two crucial issues in resource allocation for OFDMA wireless networks. The objective of this paper is to provide the required Quality-of-Service (QoS) of the guaranteed performance users with given data rate requirements and to maximize the capacity of the best effort users while maintaining max-min fairness among them. The resource allocation issue in OFDMA systems is the joint optimization of subcarrier assignment and power allocation subject to a total network power constraint. It is a mixed discrete programming issue known to be NP-hard and obtaining an exhaustive search allocation is computationally very expensive. In this paper, the algorithm to solve this non-convex problem is proposed by Lagrangian dual relaxation and obtains the optimal dual point based on the modified ellipsoid method. The algorithm has the polynomial complexity linear with the number of subcarriers. Numerical results show that the proposed algorithm can be near optimal to the globally optimal solutions in terms of both QoS satisfaction and services max-min fairness.

Keywords: OFDMA Quality of service Max-min fairness Resource allocation

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