

Adaptive Resource Allocation with Rate Constraints for Uplink SC-FDMA Systems

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Abstract:

Resource allocation in wireless networks often relies on utility-based optimization to provide the desired levels of QoS and fairness to different users. Utilities are usually function of the average rate assigned to users.

By assuming ergodic approximation, in this work we address the problem of average sum-rate maximization with rate constraints for the uplink of single-carrier frequency division multiple access (SC-FDMA) systems.

Finding optimal solution generally requires high computational complexity, because SC-FDMA imposes the contiguous allocation of the available frequency resources. In this study we investigate and compare different adaptive algorithm. To reduce complexity we also propose a novel sub-optimal algorithmic solution, based on Lagrangian relaxation of rate constraints, which exploits a simple but effective estimation of the average number of allocable subcarriers to reduce the search space. The complexity of the proposed algorithm increases only linearly with the number of users and the number of subcarriers. While in presence of proportional rate constraints the performance loss with respect to optimal solution is limited to the 10\% of the sum-rate.