

Scheduling the 3GPP LTE Uplink over a Dense Heterogeneous Network

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Abstract:

We present an approach to schedule Long Term Evolution (LTE) uplink (UL) traffic in a densely deployed heterogeneous network, where macro and small cells operate with frequency reuse 1 and Inter-Cell Interference (ICI) is a critical issue to manage. We consider a Release 9 3rd Generation Partnership Project (3GPP) compliant scenario, where Single Carrier Frequency Division Multiple Access (SC-FDMA) is selected as the multiple access scheme, which requires that all Resource Block (RB)s allocated to a single user have to be contiguous in frequency within each time slot. This adjacency constraint limits the flexibility of the Frequency-Domain Packet Scheduling (FDPS) and Inter-Cell Interference Coordination (ICIC), when trying to maximize the scheduling objectives, and this is sufficient to make the problem NP-hard.

We aim to solve a multi-objective optimization problem, taking into account criteria such as the maximization of the overall throughput, the minimization of the radio resource usage, and the minimization of ICI. This can be modeled through a Mixed Integer Linear Programming (MILP).

We present an optimal solution based on CPLEX software and a greedy solution. We discuss numerical results, with particular emphasis on implementability in the standards.