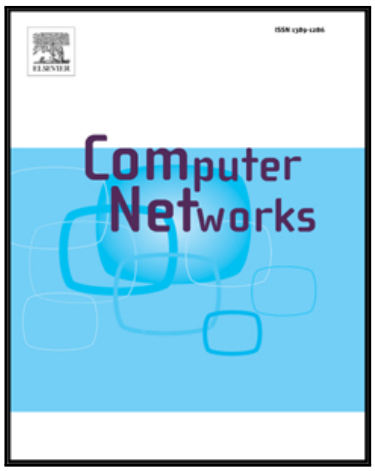

Joint Downlink Resource Allocation in LTE-Advanced Heterogeneous Networks

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PII: S1389-1286(18)30910-1
DOI: https://doi.org/10.1016/j.comnet.2018.09.012
Reference: COMPNW 6594

To appear in: *Computer Networks*

Received date: 4 February 2018
Revised date: 10 August 2018
Accepted date: 12 September 2018

Please cite this article as: Jain-Shing Liu, Joint Downlink Resource Allocation in LTE-Advanced Heterogeneous Networks, *Computer Networks* (2018), doi: https://doi.org/10.1016/j.comnet.2018.09.012

Joint Downlink Resource Allocation in LTE-Advanced Heterogeneous Networks

Jain-Shing Liu [1]

Abstract

Long Term Evolution-Advanced (LTE-A) heterogeneous network constituted by macro cells and small cells has attracted wide attentions as a solution to the data surge problem in the developing wireless networks, e.g., 5G mobile communication systems, demanding for higher bandwidth and better quality. Taking also cognitive radio into account, we develop here a dynamic resource allocation algorithm for the downlink transmission which involves resource blocks, component carriers, modulation and coding schemes, and frequency partitions with an overall consideration. Specially, we consider not only to determine the multiple kinds of resources at each transmission time interval, but also to enforce the constraints specific to the LTE-A system with carrier aggregation. To this end, we conduct a mathematical programming model which involves nonlinear constraints on binary variables to formulate the stochastic optimization problem, and introduce a submodular-based greedy algorithm to resolve the high-dimensional NP-hard allocation problem involved. In addition, for the traffic and channel conditions to be time-varying in practice, our approach based on the Lyapunov drift-plus-penalty framework requires no prior knowledge of such information to alleviate the system overhead. Given that, the greedy allocation algorithm embedded is further used to guarantee the performance of allocation by means of submodularity. Finally, the numerical evaluation is conducted to verify our approach, revealing its performance benefits complementing the previous works that pay no special attention to the issues addressed here.

Keywords: LTE-A heterogeneous wireless networks, resource allocation, carrier aggregation.

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