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Optimizing Small Cell Deployment in Arbitrary Wireless Networks

with Minimum Service Rate Constraints

Abstract:

Femtocell technology has shifted beyond indoor residential applications to cover a wider range of scenarios including metropolitan and rural areas. The term "small cell" has hence been used to denote such low-power transmission points deployed for enhancing macrocell coverage and/or capacity. While deployment of femto BSs has typically followed the bottom-up paradigm driven by the ad hoc demand of users, more and more studies have prompted a move toward a more managed deployment model for better tradeoff between performance and cost. In this paper, we investigate an optimization problem for femtocell deployment in a dense network with arbitrary topology. The goal is to determine deployment locations and operation parameters of femtocells for maximizing the number of customers supported with QoS constraints. Since the formulated problem belongs to mixed-integer non-linear programming (MINLP), we propose an anytime algorithm that transforms the joint problem into a cluster formationsub-problem (involving location selection and cell coverage) and a resource management sub-problem (involving power control and resource allocation) for effectively solving all optimization variables in an iterative fashion. Compared with other approaches for femtocell deployment, our evaluation results show that the proposed algorithm can effectively solve the target problem while striking a better performance tradeoff between computation complexity and solution quality.