
Interference-Aware Energy Efficiency Maximization in 5G Ultra-Dense Networks

Abstract:

Ultra-dense networks can further improve the spectrum efficiency (SE) and the energy efficiency (EE). However, the interference avoidance and the green design are becoming more complex due to the intrinsic densification and scalability. It is known that the much denser small cells are deployed, the more cooperation opportunities exist among them. In this paper, we characterize the cooperative behaviors in the Nash bargaining cooperative game-theoretic framework, where we maximize the EE performance with a certain sacrifice of SE performance. We first analyze the relationship between the EE and the SE, based on which we formulate the Nash-product EE maximization problem. We achieve the closed-form sub-optimal SE equilibria to maximize the EE performance with and without the minimum SE constraints. We finally propose a CE2MG algorithm, and numerical results verify the improved EE and fairness of the presented CE2MG algorithm compared with the non-cooperative scheme.