<div align="center">論　文　内　容　要　旨</div>

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学位論文題目	Research on Radio Resource Management in the Next Generation of Cellular Network 次世代のセルラネットワーク無線資源管理に関する研究

内容要旨

As long with the development of mobile network techniques and the popularization of smart terminals, the demand for mobile communication traffic has been explosively increased. To meet the increasing demands, several promising techniques are proposed into the next generation mobile communications systems, such as Carrier Aggregation (CA), Heterogeneous Network (HetNet) and Coordinated Multiple Point (CoMP). The introduction of new techniques makes the Radio Resource Management (RRM) much more complicate. RRM in mobile communication system usually involves spectrum and power resource allocation, aiming at effectively use the limited resource by adaptively allocate resource according to channel conditions. This thesis focus on solving RRM problems in the system with new techniques.

Chapter 2 gives an introduction of three promising technologies proposed in LTE-A systems, including CA, HetNet and CoMP. CA is able to flexibly utilize limited spectrum efficiency, and significantly improve peak data rates in this way. HetNet is a dense deployment of cellular networks. By adding low-power access points into a macro cell, HetNet can dramatically increase the throughput of the network. However, there are several challenges to HetNet. The major one of them is intercell interference that leads to failure transmissions of cell edge users, and therefore decreases the performance of the network. To combat with intercell interference, CoMP technology is proposed by 3GPP. CoMP mitigates the effects of intercell interference by allowing several BSs to cooperate with each other. The three technologies have attracted many attentions in both academic and industrial area.

In Chapter 3, we adopt the decomposition framework and divide the resource allocation problem with CA into three steps: Carrier Componant (CC) allocation, Resource Block (RB) allocation and power allocation. We first present an estimation approach of RB allocation to assist CC allocation and an average power distribution on per RB is adopted. Based on the approximations, we design a novel cross entropy (CE) based greedy algorithm for CC allocation (CEGA-CCA). To solve the RB allocation efficiently, we investigate the problem under the given CC allocation, and design a modified greedy algorithm based on a RB exchange strategy. Finally, to further balance the tradeoff between fairness and sum capacity, under the condition of the given CC allocation and the RB allocation results before, we also investigate the

Power-allocation by using particle swarm optimization (PSO) algorithm, a kind of heuristic method, to make this work complete. Extensive numerical simulations using Matlab are launched to verify the efficiency of the proposed algorithms.

In Chapter 4, we focus on RRM in a CoMP-based HetNet for the purpose of improving energy efficiency while guaranteeing high data rates, as well as fairness of users. An optimization problem aiming at maximizing weighted energy efficiency is formulated, where the weights are used for maintaining the fairness of users data rates. Several crucial constraints in practice are taken into considerations in the formulated problem. Besides the limitation on total power at each transmitter, backhaul links, which connecting small cells with the eNodeB for exchanging data and control information, are considered to be with restricted capacity. Additionally, the lowest data rate of each transmission is defined in order to guarantee the quality of transmissions and avoid wasting of energy. We separate the whole problem into a scheduling subproblem under the assumption of equal power allocation, and a power allocation subproblem with known scheduling results. We first proposed a centralized scheduling algorithm based on CE and a correspondingly power allocation algorithm. Since centralized algorithms involve numerous calculations, the time delay could be intolerable in a large-scale network. An alternative method to reduce the time delay is to conduct resource allocation in a decentralized way where calculations are distributed to cells. For this reason, we also propose modified algorithms that can be used in decentralized mode. At last, Extensive simulations are conducted to validate the effectiveness of the proposed schemes.