

Link adaptive power control and allocation for energy-efficient downlink transmissions in LTE systems

ABSTRACT

It is axiomatic that providing more transmission power by the cell, returns high data rates; but in contrary, more power is consumed which leads to energy exhaustion. The Quality of Service (QoS) in long term evolution urban macrocell networks gives a high concern to green communication by wisely utilizing the limited cell power to improve network performance. Nevertheless, in conventional schemes, it is observed that the maximum power assigned to the evolved Node B (eNB) is fully utilized each time transmission interval regardless the transmitted amount of data. Consequently, a high level of power dissipation commonly occurs at the eNB that is caused by either an unused allocated power or an excessive subchannel power allocation which is beyond the required portion for data blocks transmission. Therefore, in this paper, we propose an efficient scheme, namely link adaptive power control and allocation (LaPCA) to mitigate the overused transmission power of the cell, and thereby, enhancing system energy efficiency while maintaining a good QoS level. The main principle in LaPCA is to control the portion of cell transmission power to be proportional to the volume of data flows that are nominated for transmission during the scheduling process. This power is then distributed over the allocated subchannels by means of nonconvex optimization to enhance system performance. System-level simulations reveal that LaPCA achieves an outstanding energy efficiency and maintains an increased throughput level and low loss ratio as more traffic load is offered to the network.

Keyword: LTE; QoS; Power allocation; Power control; Nonconvex optimization; Energy efficiency; System capacity