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Network Planning and Smart Network Control in Ultra-Dense Cellular Networks.

ABSTRACT - Masterthesis

The vision of 5th Generation (5G) networks is to provide more network capacity and the effective way to increase the network capacity is extreme densification, resulting in ultra dense networks (UDN). Densification is the massive increase in the number of Base stations. As the densification becomes extreme, the computation of the base station transmit power and managing the base station load is challenging. The computation of base station power can be characterized as the solution of fixed-point problems.

In this thesis work, we consider an existing interference coupling model involving the concept of cell load in OFDMA networks. Previous studies have computed the fixed-point of power coupling mappings by standard fixed point iterations and this becomes complex in extreme dense networks.

The main aim of this thesis is to accelerate the convergence to the fixed point and this is achieved by employing an extrapolation methods. We show that the standard fixed point iterations using the MPE (Minimal polynomial Extrapolation) and RRE (Reduced rank Extrapolation) converges faster than the normal standard fixed point iterations. The performance of the extrapolation methods is demonstrated and compared with other convergence techniques such as accelerated mappings using lower bounding matrix and standard fixed point iterations. In this thesis work we have developed a stadium model that represents the ultra dense network for the simulation and analyzed the performance of the extrapolation methods by considering different base stations density of the stadium. From this thesis work, we observe that the extrapolation method requires only few hundreds of iterations as compared to the standard fixed point iteration technique which normally requires more than 1000 iterations. Also we show that these extrapolation methods tend to converge to the fixed point quadratically. These extrapolation methods are particularly important in planning and optimization tasks in wireless networks.