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A NEW HYBRID MATHEMATICAL MODEL FOR INTERFERENCE MANAGEMENT BY COMBINING OF FRACTIONAL FREQUENCY REUSE AND DYNAMIC POWER CONTROL METHODS IN FEMTOCELL NETWORKS

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ABSTRACT

The increase in capacity and system data rate may lead to capacity problems and hence become one of the crucial issues in any Mobile Communication Networks. Although the Long Term Evolution (LTE) is called the 4th Generation of the Mobile Cellular Communication Network, it can no longer solve the problem regarding the capacity of the cell. In order to cope with the increase in demand for stable and high data rates among mobile users, femtocell or Home Evolve Node B (HeNB) has been developed to improve indoor capacity and coverage. Deploying femtocells in macrocell are one of the efficient ways to improve the performance of mobile services in high traffic congested areas. Femtocell is a small and lightweight base station that aims for indoor usage such as at home or in an enterprise and provide better user experiences to users. However, femtocell deployments caused interference between femtocells itself and also to the existing macrocells. This thesis studied the two combining interference methods in LTE Heterogeneous Networks (HetNets) in order to reduce interference in HetNets which are the Fractional Frequency Reuse (FFR) and Dynamic Power Control (DPC) methods. The FFR method highlights the significance of two parameters which are the fraction of radius in center region (r_{th}) as well as the fraction of the system bandwidth (β) allocated for the center area while the DPC method highlights the importance of the parameter Path Loss (PL) compensation factor (α). This thesis proposed a new hybrid mathematical model for interference management by identifying the effect of r_{th}, β and α on the improvements value of capacity, throughput as well as the Signal to Interference plus Noise ratio (SINR). The proposed r_{th}, β and α value were then used in simulation model by using the MATLAB software to analyze the number of handovers occurred for the proposed method and comparing its performance improvement with the conventional method. The simulation results showed that the proposed method give higher values of the macrocell and femtocell SINR by 135.71% and 50.54% respectively. It showed that there was a significant reduction the inter-cell interference in LTE HetNets by offloading the macrocells traffic to the femtocells and higher load balancing performance can be achieved and hence reducing the number of handovers.

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