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Investigation and Implementation of Inter-Cell Interference Coordination Techniques for Long Term Evolution Mobile Networks

ABSTRACT - Masterthesis

As the number of wireless communication subscribers grows day by day, the demand for high capacity and coverage networks is increasing in parallel. Two years ago, in 2008 Q4, the third generation partnership project (3GPP) had completed one standardization process, known as "3G Long Term Evolution (3G LTE)", concerning the evolution of existed third generation systems. LTE is targeting to provide 100 Mbps data rates at the downlink and 50 Mbps at the uplink communication. LTE will enable people to experience richer communication in terms of new types of services, for e.g. online gaming, fast video streaming at lower prices. At present, LTE is in deployment stage in various countries. In cellular technologies like GSM and UTMS, the number of frequency resources is limited. So, in order to provide the communication over a large geographical area, these limited resources have to be reused again. The reuse of frequency resources should take place at a distance to avoid interference. Therefore Radio Resource Management (RRM) techniques play a vital role to make best use of these limited resources and interference avoidance schemes act as a heart of any RRM technique.

Orthogonal Frequency Division Multiplexing (OFDM) is the proposed modulation scheme for 3G LTE wireless communication systems. Orthogonal Frequency Division Multiple Access (OFDMA) combats the Intra-cell interference inside a single cell by utilizing the remarkable feature of orthogonality between its sub-channels. But due to the limited number of resources available, the need for frequency reuse to accommodate a large number of users causes inter-cell interference among the neighboring cells.

This thesis tries to answer the question of how to effectively manage or allocate the available resources i.e. frequency and power, to the users in a coordinated way, so that the interference can be avoided. This coordination is very important especially for the users located at the boundary of the cell edge. Boundary users suffer a lot due to their high pathloss to their serving base stations (eNodeBs) in addition to the interference received from the neighboring eNodeBs, and contribute very less, when calculate the total throughput of the network. Fractional Frequency Reuse (FFR) will be the proposed scheme in this thesis work to avoid Inter-cell Interference (ICI). Simulation results quantify the performance of FFR scheme as compared to conventional frequency reuse in terms of average cell throughput and Signal to Interference plus Noise Ratio (SINR) of boundary users.