Abstract of Main Thesis

Title of Thesis

STUDY ON NON-LINEARITY EFFECT REDUCTION AND FAIRNESS IMPROVEMENT FOR MULTICARRIER COMMUNICATION SCHEMES

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Abstract on the Content of the Applicant's Thesis

Multicarrier communication systems have strong potentials of becoming the de-facto underlying mechanism of future generation multiple access method. This is because they are capable of high speed data transmission even in harsh wireless propagation environment - one of the key requirements of future generation data-centric wireless services. In this respect, based on the basic principle of Orthogonal Frequency Division Multiplexing (OFDM) technique, two multiple access methods, i.e., i) Orthogonal Frequency Division Multiple Access (OFDMA) and ii) Multicarrier Code Division Multiple Access (MC-CDMA) are considered by many as techniques that are in strong contention to be used in parallel. Both of them show good resilience against inter symbol interference caused by multipath propagation even at high data-rate. But there are challenges also. One common problem is vulnerability to non-linear distortion due to high peak to average power ratio (PAPR). Again, resource allocation in terms of subcarrier allocation in OFDMA also needs attention. In this thesis, we study the PAPR issue of OFDM, OFDMA and MC-CDMA along with the fairness issue of OFDMA. For MC-CDMA, we investigate the envelop peak property of a new set of spreading codes called ``Orthogonal Binary User Codes (OBU)". We show both analytically and with simulation its properties for both single user uplink and multiuser downlink scenario. In particular, by applying the correlation properties of the underlying spreading codes, we propose an adaptive code allocation table consisting of OBU and show that it outperforms the well known Walsh-Hadamard codes. Then based on OFDM, i.e., the core of both OFDMA and MC-CDMA, we propose a modified approach of subcarrier switching for PAPR reduction with lowered computational complexity. Finally, for OFDMA, we explore the fairness issue from subcarrier allocation perspective through different types of interleaving and propose method to achieve better performance without sacrificing major loss in throughput. In the same context, we also look into the PAPR issue.