Abstract

Multiple-Input-Multiple-Output (MIMO) Orthogonal Frequency-Division Multiplexing (OFDM)- Code Division Multiple Access (CDMA) is a key technology for next-generation cellular communications (3rd Generation Partnership Project (3GPP): Long-Term Evolution (LTE), Mobile Worldwide Interoperability for Microwave Access (WiMAX), Integrated Microwave Technologies (IMT) -Advanced). This thesis investigates the enhancement of the performance of OFDM-CDMA and MIMO-based systems. The system capacity is studied and the theoretical results are supported by MATLAB simulations.

A MIMO communication system is one of the most important technologies in the modern telecommunications revolution. The important job of an instantaneous MIMO channel is to control the capacity of the system. Thus, one way for improving the capacity of a MIMO system based on manipulating receive-and-transmit antenna correlation matrix has been proposed. Here, for any specific realization of channel, we try to derive the optimal channel correlation matrix, which maximizes the channel capacity.

The thesis also explores the combination of OFDM and CDMA, which is referred to as OFDM-CDMA or multicarrier CDMA with MIMO communications. The performance of the MIMO OFDM-CDMA receivers are investigated over Raleigh fading channels with different combinations of transmit and received antennas in order to achieve the best performance. The Maximum Likelihood (ML), Zero Forcing (ZF), and Minimum Mean Square Error (MMSE) receivers are applied as detection criteria.