Abstract

In wireless communication systems, the Multiple-Input Multiple-Output Orthogonal Frequency Division Multiplexing-Code Division Multiple Access (MIMO-OFDM-CDMA) is one of the most promising techniques which support high data rate and high performance.

This study aims to present a systematic investigation of the (MIMO-OFDM-CDMA) system with adaptive bit loading to provide further flexibility in the user multiplexing, and data rate adaptation that offers higher system throughput and best diversity gains.

In this study, the adaptation techniques are applied that can realize high spectral efficiency for MIMO-OFDM systems. Two types of adaptation techniques, namely: adaptive modulation and adaptive power allocation are employed to adapt the rate and the transmit power. Adaptive bit loading in MIMO-OFDM is also used to maximize the transmission rate along with the desired Bit Error Rate (BER) performance in wireless systems.

Further, the combination of OFDM and CDMA with MIMO communications is addressed. The performance of the MIMO-OFDM-CDMA receivers are investigated over fading channels along with applying different groups of transmit and receive antennas on multi modulation in order to achieve the best performance.

Orthogonal Frequency Division Multiplexing (OFDM) in conjunction with adaptive modulation was applied to Multiple Input Multiple Output (MIMO) systems in order to enhance the power allocation and obtain the optimum bit allocation for each subcarrier.

Two algorithms namely; FISCHER-HUBER and RATE-ADAPTIVE algorithms were investigated to achieve the aforementioned goal. The first algorithm allocates a fixed amount of power and bits while the second algorithm presents low complexity non iterative discrete variable bit allocation.

Fischer-Huber loading algorithm attempts to minimize the probability of bit error by maximizing the signal to noise ratio (SNR). Bits are allocated to achieve the same error probability in each of the used subcarriers. The study found the improvement to the Fischer-Huber algorithm by power reallocation achieves better performance in terms of the symbol error rate (SER). Finally, the study is concluded with recommended further relevant future works and research.