Synopsis

The exaltation of powerful multicarrier orthogonal frequency division multiplexing (OFDM) integrated with multiple-input multiple-output (MIMO) systems has numerous benefits, which are detailed in this dissertation. In the foreseeable future, the large scale expansion of wireless devices and the requirements of high-bandwidth applications are excepted to lead to tremendous new challenges in terms of the efficient utilization of the achievable spectral resources. The various communication standards like wireless local area network (WLAN), worldwide interoperability for microwave access (WiMAX), fourth generation (4G) mobile communication and digital video broadcasting (DVB) are using MIMO-OFDM technique for high date rate transmission.

In Chapter 2, various efficient schemes for PAPR reduction and channel equalization in MIMO-OFDM systems are presented through conventional and soft-computing approaches. The PAPR reduction and equalization are simulated in MATLAB (R2011) environment and their respective efficiency are compared based on the performance metric, viz., complementary cumulative distribution function (CCDF), power spectrum, bit error rate (BER) and computational complexity for IEEE 802.11a (Wireless LAN) and IEEE 802.16e (WiMAX).

In Chapter 3, the two hybrid methods are proposed for PAPR reduction in MIMO-OFDM system. The hybrid methods combine two popular conventional schemes such as, approximate gradient project (AGP) and partial transmit sequence (PTS) approaches. The first hybrid proposal is the serial combination of AGP and PTS in time domain. The cumulation of AGP and PTS block in time domain reduces the complexity by removing the several IFFT blocks from the PTS module. In the second proposal, i.e., parallel combination of AGP and PTS resolves the issue of PAPR reduction for large number of subcarriers upto large extend.

Equalization is a technique to mitigate the effect of inter symbol interference (ISI)

which minimizes BER at the receiver. Linear equalization algorithm are generally simplest to implement, but suffers from noise enhancement in frequency fading environment. In Chapter 4, the proposed equalization algorithm improves the BER performance as compared with other equalization technique and reduces in ISI, noise as well as interference in the MIMO-OFDM system.

In Chapter 5, philosophy behind the use of neural network (NN) in the MIMO-OFDM system is to reduce the computational complexity of proposed hybrid PAPR reduction scheme without sacrificing the BER performance. NN based proposed models have low PAPR, less computational complexity than the other PAPR reduction schemes in MIMO-OFDM system. The power spectrum and BER performance of these proposals is also maintained under the Rayleigh faded environment.

The proposed work in Chapter 6, involves the training with adaptive network based fuzzy inference system (ANFIS) structure using signals of hybrid PAPR reduction methods in MIMO-OFDM. The proposed ANFIS based PAPR reduction methods not only reduces PAPR and computational complexity, but also provides better BER performance with less convergence time when compared with the other conventional and hybrid methods. In Chapter 7, it is concluded that the proposed methods shows better performance in terms of PAPR reduction, BER, complexity reduction and computation time which are very good choice for wireless LAN and WiMAX applications. In future, this work can also be extended towards application of proposed methods for multi-user (MU) MIMO-OFDM.