CONCLUSION AND FUTURE SCOPE

In this thesis, one of the major drawbacks in OFDM system viz. problem of large PAPR has been discussed and analyzed. A variety of techniques that are able to reduce the PAPR are explained through algorithms and simulated using Matlab environment. The performance and effectiveness of each proposal is compared on the basis of its BER, power spectrum and computational complexity which varies case to case.

7.1 Conclusion

The various proposals to reduce PAPR are presented based on both the conventional and soft computing based techniques. Each proposal is tested for wireless standards viz. IEEE 802.11a (WLAN) and IEEE 802.16e (WiMAX) have 64 and 256 number of subcarriers respectively. The detail contribution of thesis is described as follows:

- **Serial and parallel combination of conventional PAPR reduction schemes for OFDM:**
  The first contribution of the work is to emphasize on Partial Transmit Sequence (PTS) and Approximate Gradient Project (AGP). The comparative study of various PAPR reduction techniques illustrate that the scrambling method viz. PTS are best in PAPR reduction while constellation approach (AGP) requires less computational complexity. The proposed serial and parallel combination of AGP and PTS techniques are known as Probabilistic Constellation Extension (PCE) and Partial Approximate Gradient Constellation (PAGC) respectively. The simulation results verified that the PAGC shows less PAPR compared to PCE technique. Simultaneously, BER and spectral spreading are also maintained of proposed techniques when compared with conventional techniques. On the other hand, the drawbacks of both schemes are data rate loss, computational complexity and side information.

- **PAPR reduction without data rate loss:** The second proposal is to use Null sub Carrier Switching (NCS) with AGP method. The proposed scheme switches one or more null carriers with data sub carriers to offer minimum PAPR and requires no channel side information during transmission. The linear combining improves spectral spreading over particular frequency band, i.e. in-band distortion and out-of-band radiation. At the same time, high computational complexity is required to find suitable switching peak data subcarrier with pre-defined null subcarrier.
Artificial Neural Network (ANN) to resolve computational complexity for PAPR reduction method: The proposal is to solve the problem of high computation in proposed scheme. Here, Multi Layer Perceptron (MLP) with Levenberg–Marquardt (LM) algorithm is used to train the data of NCS and AGP-NCS scheme. This scheme imposes “no rate-hit”, the constellation remains unchanged at each data sub-carriers during this process as well as no side information required at the receiver. The proposed method is compatible with existing OFDM standards and can be supplemented to the other PAPR reduction techniques.

Adaptive Network-Based-Fuzzy Inference System (ANFIS) based architecture to reduce offline training time for PAPR reduction technique: The addition of ANFIS in AGP-NCS scheme provides better results compared to ANN based technique. The main focus of the proposed approach is to reduce computational complexity significantly without much deteriorating the performance of the system. This approach not only reduces the computational complexity of the system but offers small offline training time as compared to ANN scheme. Moreover, the ability of ANFIS structure for online training make this scheme very useful for real time applications where ANN based scheme fails to perform.

7.2 FUTURE SCOPE

As it is an established fact, that research is never ending process, a new beginning is always waiting. The PAPR problem in OFDM is still an ongoing issue, especially for portable devices where the need to minimize the power amplifier linear range is paramount. Therefore, following are the works that may be considered as a future scope in this direction:

- The proposed PAPR reduction method can be used with Multiple-Input Multiple-Output (MIMO) system. Even, some other standard application of OFDM such as Digital Audio Broadcasting (DAB), Digital Video Broadcasting (DVB), and Third Generation Partnership Project (3GPPP) systems.
- In this work, it is assumed that the channel is estimated perfectly as Additive White Gaussian Noise (AWGN). Hence, one can evaluate the performance of proposed work with the different channel estimation methods.
- Design and test ANFIS on system with online training for real time applications.