

OFDM PAPR Reduction with Enhanced Filtering Methodology in Wireless Communication

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Abstract— Due to the advancement in wireless communication, multimedia based applications are growing and these applications require high speed data transmission. Accordingly, OFDM abbreviated as orthogonal frequency division multiplexing provides orthogonal subcarriers as well as uses bandwidth efficiently. With the number of increment of subcarriers in OFDM will increase Peak-to-Average Power Ratio which will cause distortion at the time of passing from non-linear amplifier [1]. There are several techniques that have been to reduce Peak-to-Average Power Ratio (PAPR) but still there is lot to work on it. Thus, proposed techniques are mentioned in this paper for the reduction of PAPR with the increment in the efficiency of the system. Experiments have been performed on the signal and results ensure that the performance of the proposed techniques is better than the existing one. In this paper a new approach for PAPR has been introduced. Proposed technique is known as hybrid technique. It is a combination of two techniques namely SLM and Companding respectively. SLM is a most preferable technique to reduce PAPR. Simulation is performed in MATLAB to prove the efficiency of proposed hybrid technique.

Key words: Enhanced Filtering Methodology, OFDM

I. INTRODUCTION

Due to the advancement in wireless communication, multimedia based applications are growing and these applications require high speed data transmission. Accordingly, OFDM abbreviated as orthogonal frequency division multiplexing provides orthogonal subcarriers as well as uses bandwidth efficiently. PAPR (Peak-to-Average Power Ratio) is the one of the challenging issue in the multi carrier systems i.e. OFDM systems. PAPR should be reduced so that Performance of these systems can increase. In comparison with single carrier systems PAPR is high in multi carrier system. High PAPR reduces the efficiency of the Power amplifier (Transmitter) [3]. AN hybrid approach is developed in this to reduce the PAPR.

II. PROBLEM STATEMENT

In OFDM modulation, the high peak-to-average power ratio (PAPR) of transmitted signal due to the superposition of many subcarriers is one of the major problems. Due to the rise of PAPR in the signal the quality of the signal is degraded, also the complexity is increased in the analog to digital and digital to analog converter. So it is essential to decrease the PAPR, there are many techniques have been suggested for PAPR reduction, with different levels of success and complexity. Techniques like clipping, filtration, PTS etc were proposed but these techniques achieve PAPR reduction at the bit error rate (BER) increase, data rate loss, computational complexity increase, and so on. So there is need to proposed some other techniques that can reduce

PAPR to a great extent, by studying previous PAPR reduction techniques, a new technique is proposed in this thesis. In this thesis, work is done on the basis of hybridization of reduction techniques. As clipping can only clip the portion of the signal, Companding technique is used to improve BER performance of the system and filtering is used to filter the signal. So in this along with clipping, Companding and filtration clipping is used together, by joining these three techniques the ratio of PAPR in the received signal is low. Therefore this approach can result in the output signal with lessen PAPR. Also there is low implement complexity and there is rise in gain of the signal.

III. OBJECTIVES

The main objectives of the proposed work are:-

- 1) To analyze or study various PAPR reduction techniques.
- 2) To implement Hybrid approach for PAPR reduction.
- 3) To reduce system complexity and performance degradation.
- 4) To analyze the performance parameters and compare them with traditional approaches.

IV. PROPOSED METHODOLOGY

PAPR is the major problem in OFDM technique, so there is need to reduce the PAPR, in order to get better quality signal. Many techniques have been applied earlier to reduce its effect. It may be better understood from the flowchart shown as below:

A. Flow Chart

In this proposed method two techniques are used firstly the SLM is done and then Companding is applied on it. The methodology of the proposed work is described below:

- 1) Firstly generate a signal that carries information, which is to be sent to the receiver without out any distortion.
- 2) After the generation of the information signal, apply the modulation technique, so that the signal is transmitted with less distortion.
- 3) After the modulation, padding of signal is done, before applying the IIFT
- 4) After applying the padding on the signal, apply the IIFT on that signal
- 5) Now apply the selective mapping (SLM) technique on the signal, in order to lessen the PAPR effect.
- 6) After apply the SLM technique to the signal, now apply Companding technique on the signal to reduce the effect of PAPR, as this PAPR is the major problem in the signal and should be minimized.
- 7) Finally the calculation of the PAPR is done. The signal with lessen PAPR is obtained.
- 8) A Compassion between the proposed and the traditional approach is done.

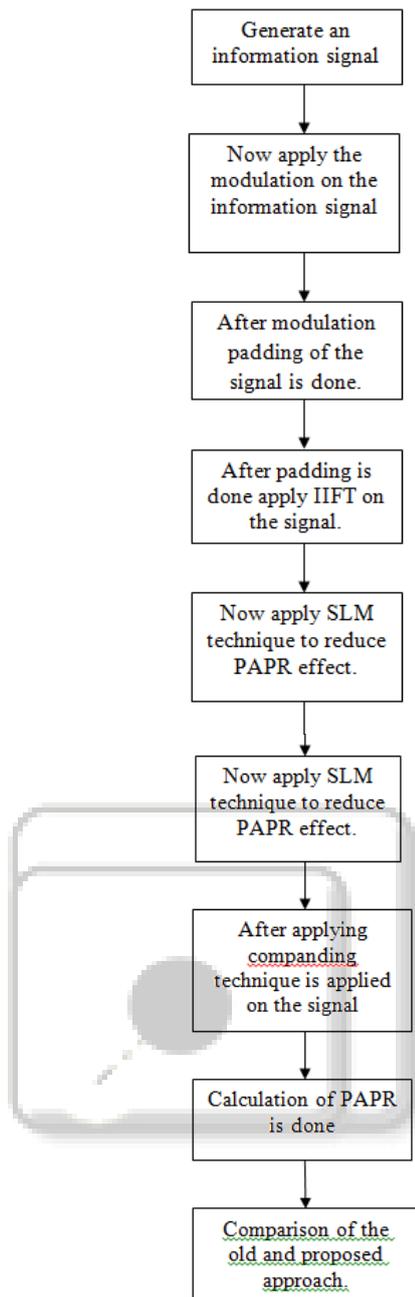


Fig. 1: Flowchart

V. EXPERIMENTS AND RESULTS

In this section of Results and discussion we have discussed about the results that were obtained by applying proposed method. This section gives description of the proposed techniques that is represented with the help of graphs. In the propose work new method of PAPR reduction is proposed. OFDM is one of the many multicarrier modulation techniques, which provides high spectral efficiency, low implementation complexity, less vulnerability to echoes and non – linear distortion. But it does not support the higher value of PAPR. In this proposed method the SLM technique for PAPR reduction is applied to the signals. After this the Companding is applied. The results show this method is better and efficient than traditional method. In this figure, the original signal in the OFDM system is represented. The above figure shows the signal along with PAPR effect.

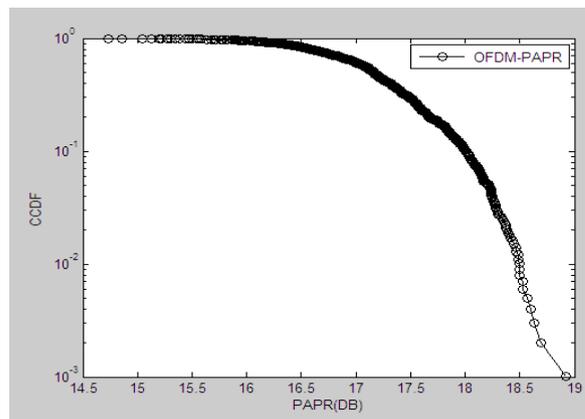


Fig. 1: signal along with PAPR effect

In this figure there is comparison between original signal in OFDM with the effect of PAPR and the signal which is obtained after applying SLM technique. It shows that the PAPR in by using SLM technique in OFDM is less than The OFDM PAPR. Hence it proves that the SLM technique is most suitable to decrease the PAPR in OFDM. PAPR is measured in dB i.e. decibels.

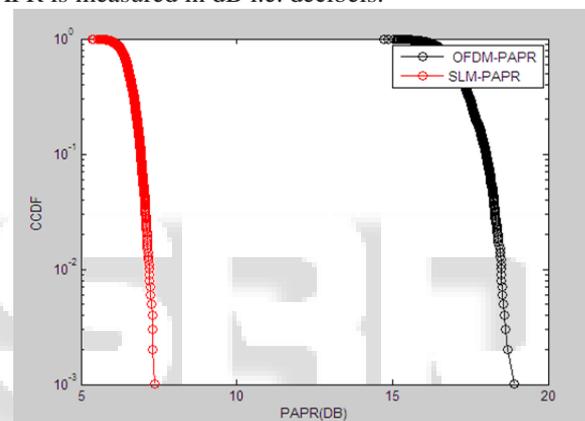


Fig. 2: comparison between original signal in OFDM with the effect of PAPR

Figure below shows the comparison between PAPR reduction techniques. One is SLM technique and another is proposed hybrid approach of PAPR reduction.

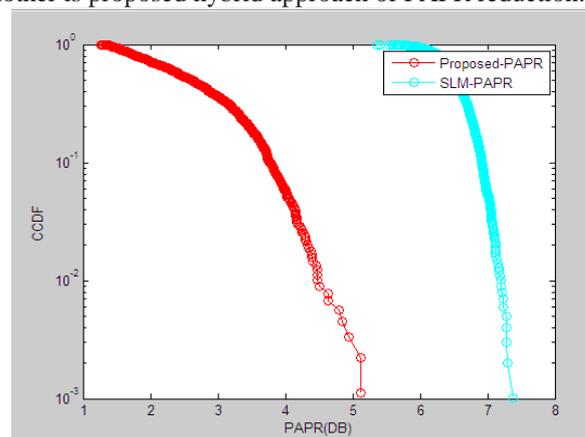


Fig. 3: Shows the PAPR in traditional SLM and hybrid technique

In figure below three signals are compared first one is original OFDM signal with PAPR, second is obtained after applying traditional SLM technique to reduce PAPR and third one is after applying Hybrid technique which is a combination of SLM and Companding technique.

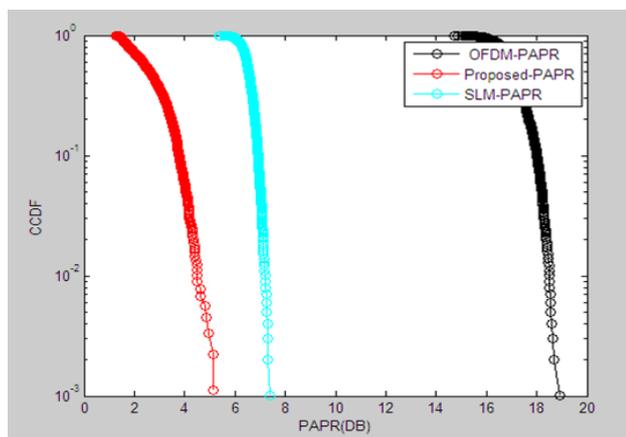


Fig. 4: Shows the PAPR in case of OFDM, traditional SLM and Proposed hybrid approach

VI. CONCLUSION AND FUTURE SCOPE

OFDM stands for Orthogonal Frequency Division Multiplexing. In this a channel is divided into various sub channels and then a signal is transferred through these sub channels. OFDM facilitates the data transmission at a high speed rate. Orthogonal frequency division multiplexing is a method or scheme for digital multi-carrier modulation using some independent subcarriers - a previously modulated signal modulated into other signal that have high frequency and bandwidth. OFDM is used in many fields like DAB, Digital Video Broadcasting. OFDM transfers the data with a high transmission rate. OFDM also has the ability to solve the problem of multi path interference and frequency fading. OFDM uses the orthogonal subcarriers for data transmission. The only disadvantage of OFDM is that it does not support the higher PAPR. To overcome this problem we used a hybrid approach in proposed work. In proposed hybrid technique two methods are combined together to reduce PAPR. The two combined techniques are SLM and Companding. From the result of simulation it is observed that the proposed technique is well efficient as compare to other traditional techniques. It works very well to reduce PAPR in OFDM system. In future we can add various trending technique to reduce PAPR.

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