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A Weighted OFDM Signal Scheme for Peak To Average Power Ratio Reduction Of OFDM Signals

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ABSTRACT: To reduce the Peak to Average Power Ratio (PAPR) in OFDM system using Genetic Algorithm (GA) based approach and also reduce its complexity by the reducing the number of iteration. Basically OFDM has several attributes for high speed wireless communication. However the increased PAPR of the signal is main drawback of OFDM signal which restricts the efficiency of transmitter. So this paper is focused in the domain PAPR reduction of OFDM signals by using weighted OFDM signal scheme.

KEYWORDS- Genetic algorithm (GA), peak to average power ratio (PAPR), Selected mapping scheme (SLM), Nonlinear compounding Techniques (NCT)

I. INTRODUCTION

Around 1805, Carl Friedrich Gauss invented a revolutionary technique for efficiently computing the coefficients of what is now called discrete Fourier series. Unfortunately, Gauss never published his work and it was lost for over one hundred years. During the rest of the nineteenth century, variations of the technique were independently discovered several more times, but never appreciated. In the early twentieth century, Carl Runge derived an algorithm similar to that of Gauss that could compute the coefficients on an input with size equal to a power of two and was later generalized to powers of three.

Over 2,000 additional papers have been published, and the Fast Fourier Transform (FFT) has become one of the most important techniques in the field of Electrical Engineering. The revolution had finally started; Charles Fiducia showed for the first time that the FFT can be computed in terms of algebraic modular reductions. As with the early FFT publications, this idea has been generally ignored. However, Daniel Bernstein recently wrote several unpublished works, which expand upon the observations of Fiducia and show the algebraic transformations involved in this approach to computing the FFT.

Several applications of the FFT that can be improved using the new algorithms including polynomial division, the computation of the greatest common divisor, and decoding Reed-Solomon codes. Another motivation for writing this is to provide a treatment of the FFT that takes the perspective of both mathematicians and engineers into account so that these two communities may better communicate with each other. The engineering perspective of the FFT has been briefly introduced in these opening remarks. Now consider the mathematician's perspective of the FFT.

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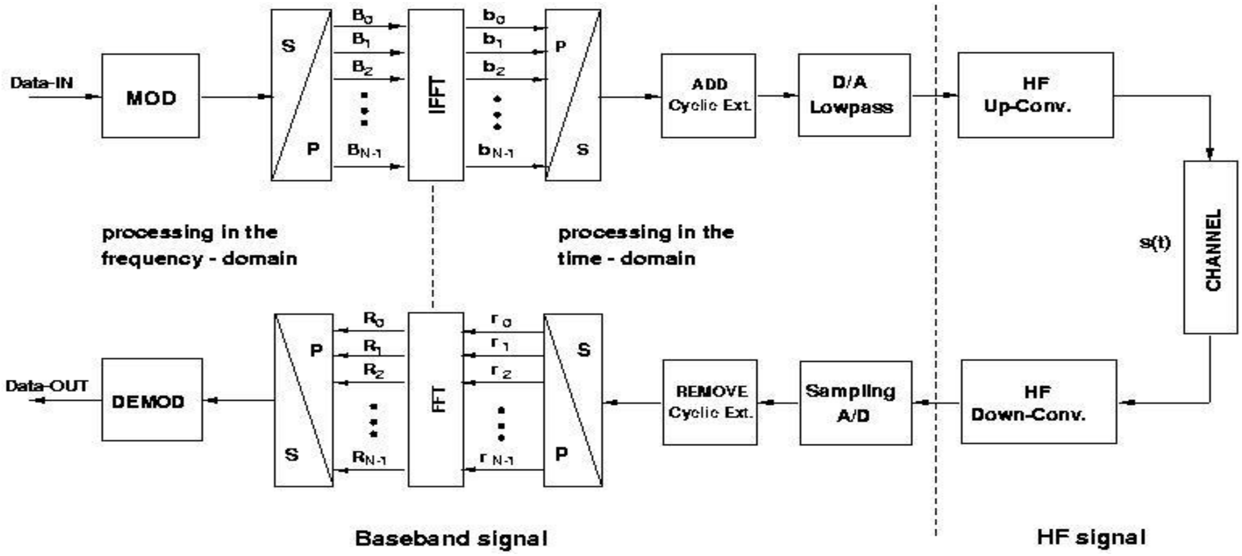

Figure 1 Bock diagram of OFDM

1. PAPR in OFDM

One of the main disadvantages of the OFDM systems is the high PAPR of the transmitted signal due to the combination of N modulated SCs.

II. PAPR REDUCTION TECHNIQUES

This paper introduces the main PAPR reduction techniques in OFDM systems. Several conventional techniques for PAPR reduction in the OFDM systems are investigated. Moreover, the criteria for selecting the reduction technique that can reduce the PAPR effectively and simultaneously maintain the high-quality performance are studied. Finally, it presents the literature review of the recent research scenarios in PAPR reduction based on the PTS and SLM scheme.

2. Significant PAPR Reduction Schemes

Various techniques have been proposed to reduce the PAPR comprising amplitude clipping, clipping and filtering , coding schemes , phase optimization, NCT , TR and TI , active constellation extension ACE , multiple signal representation techniques such as PTS and SLM and interleaving.

Clipping and filtering

The most straightforward and widely used technique of PAPR reduction is amplitude clipping. This technique can be implemented by either clipping parts of the signals that are greater than a threshold level or by transmitting the input signal below the threshold level without clipping. In the clipping technique, the BER performance of the OFDM systems is deteriorated due to the in-band distortion, while the spectral efficiency is degraded owing to the out-of-band radiation. The out-of-band radiation can be decreased by filtering the signal after clipping it.

Partial transmit sequences scheme

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In this technique, the input data block d, which consists of N symbols, is partitioned into V disjoint sets d (v), v = 0, 1, V −1 and zero padded left and right to obtain

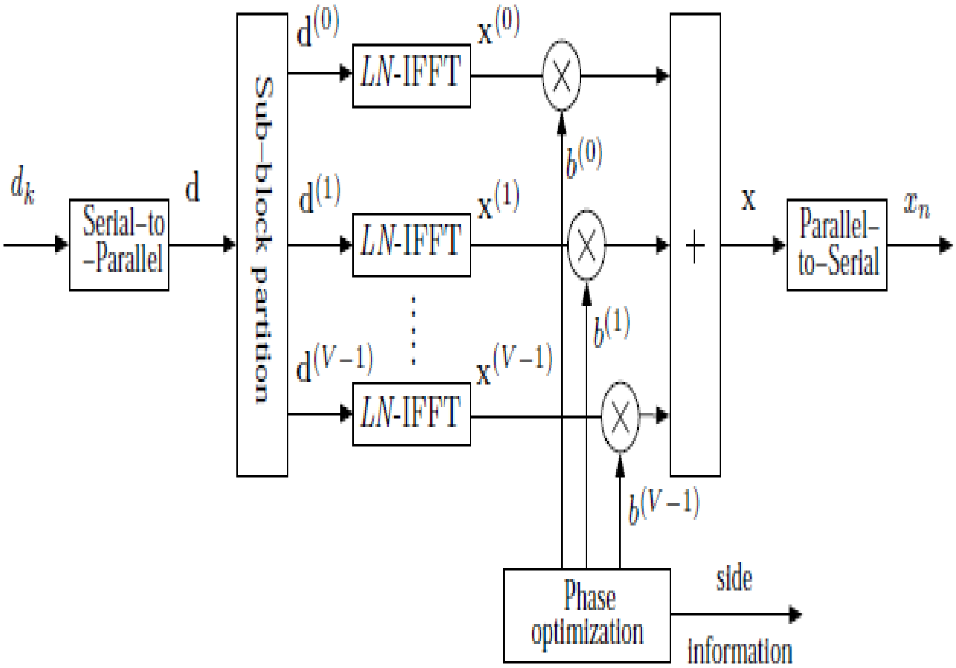

Figure2. Block diagram of PAPR reduction schemes

Selected mapping scheme

The block diagram of the conventional SLM (CSLM) scheme is shown in Fig. 3.4 [40]. The data symbols are copied into U sections, each multiplied by U different phase sequences a (u) = [a(u)0 , a(u) 1 , · · · , a(u) N−1] with u = 0, 1, · ·

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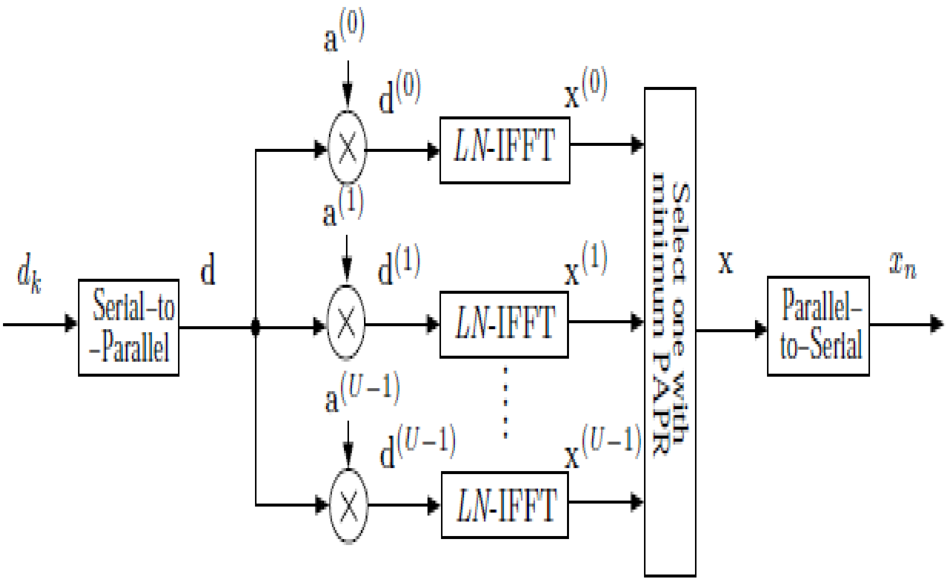

· ,U – 1.

Figure 3 block diagram of SLM method

Nonlinear companding transforms

One of the interesting PAPR reduction approaches are NCT. These transforms have two main advantages in addition to high capability to the PAPR reduction: low implementation complexity and no bandwidth expansion.

Tone reservation and tone injection schemes

TR and TI are two well-known schemes to reduce the PAPR of OFDM systems. The OFDM signal peaks can be reduced by inserting a subset of tone-dependent time-domain signals to the original OFDM signal. The time-domain signal can be calculated easily using different algorithms at the transmitter and discarded at the receiver. Note that the inserted signals have no effect on the data carrying SCs as the SCs are orthogonal in the OFDM systems. The transmitter of the TR scheme sends data on a large subset of SCs to minimize the PAPR reduction.

III. FACTORS FOR SELECTING THE PAPR REDUCTION TECHNIQUE

Several factors should be considered for selecting the technique that can reduce the PAPR effectively while simultaneously maintaining the high-quality performance.

These factors are as follows:
1. High capability PAPR reduction: clearly, this is the major factor to be taken into account for selecting the PAPR reduction method. In particular methods such as the amplitude clipping and NCT, the destructive effects of the in-band distortion and out-of-band radiation should be considered.
2. Low average power in transmit signal: the average power of the transmit signals is increased after utilising some PAPR reduction methods such as TR and TI. The average power must be normalised after the PAPR reduction to the power level before the PAPR reduction. This normalisation causes degradation in the BER performance.
3. No BER performance degradation at the receiver: the main idea of the PAPR reduction in OFDM signals is to achieve an improvement in the BER performance. This performance degrades due to the in-band distortion in clipping

and NCT schemes. Furthermore, recovering the side information incorrectly at the receiver side in the PTS and SLM schemes is another cause of BER performance degradation.

4. No loss in data rate: in consequence of sending the SI, the signal bandwidth expands in a few schemes such as PTS, SLM and coding. The data rate will reduce due to the bandwidth expansion. To perform the original data rate of the OFDM signal, the SI should be embedded.

5. Low computational complexity: commonly, more complex schemes can achieve superior PAPR reduction. However, a scheme such as PTS reduces the PAPR by exhaustive searching of weighing phase factors. Therefore, the desired time and hardware for the PAPR reduction should be reduced to the minimum possible.

6. No spectral spillage: OFDM is immune to the multipath fading consequently

3.Genetic algorithm for PAPR reduction of OFDM signal

```
Choose an initial population of chromosomes;
While termination condition not satisfied do
Repeat
    If crossover condition satisfied then
    {select parent chromosomes;
    Choose crossover parameters;
     Perform crossover};
    If mutation condition satisfied then
     {choose mutation points;
      Perform mutation};
     Evaluate fitness of offspring
   Until sufficient offspring created;
   Select new population;
   End while
```

Crossover

Crossover is simply a matter of replacing some of the genes in one parent by the corresponding genes of the other. Suppose we have two strings a andb, each consisting of 6 variables, i.e. which represent two possible solutions to a problem. (Note that we have chosen here to leave the alphabet unspecified, to emphasize that binary representation is not acritical aspect of GAs.) One-point crossover (1X) has been described earlier; two-point crossover (denoted by 2X), is very similar. Two cross points are chosen at random from the numbers and a new solution produced by combining the pieces of the original 'parents'.

Mutation

In the case when crossover-OR-mutation is used, we must first decide whether any mutation is carried out at all. Assuming that it is, the concept of mutation is even simpler than crossover, and again, this can easily be represented as a bit-string.

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IV. RESULT AND DISCUSSION

SIMULATED OUTPUT

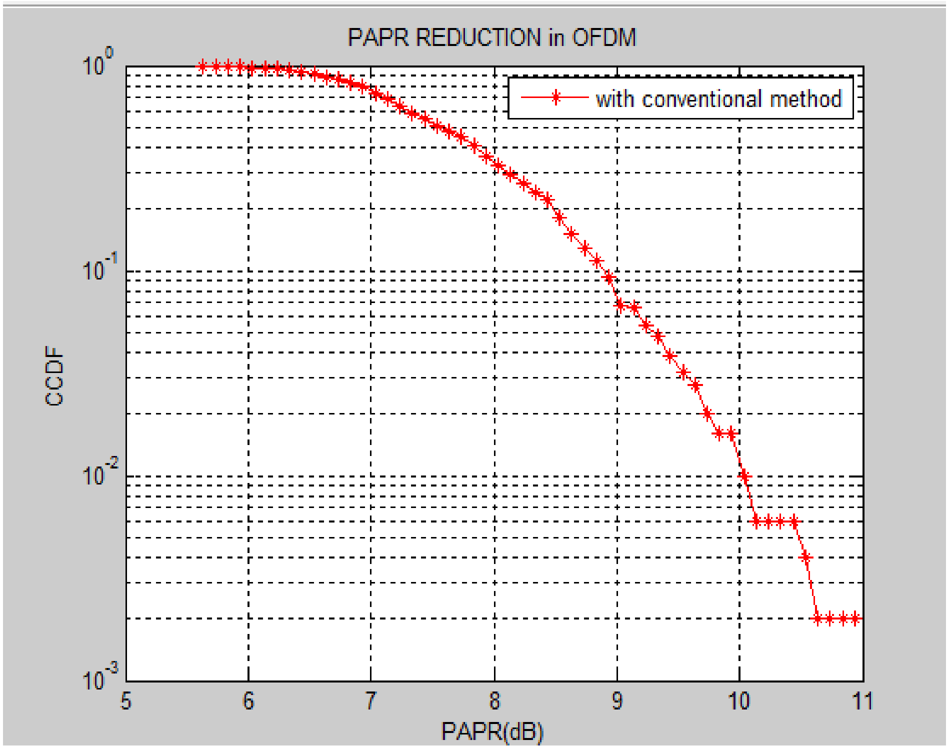

Figure 4 conventional method

COMPARISION PTS OVER CONVENTIONAL METHOD:

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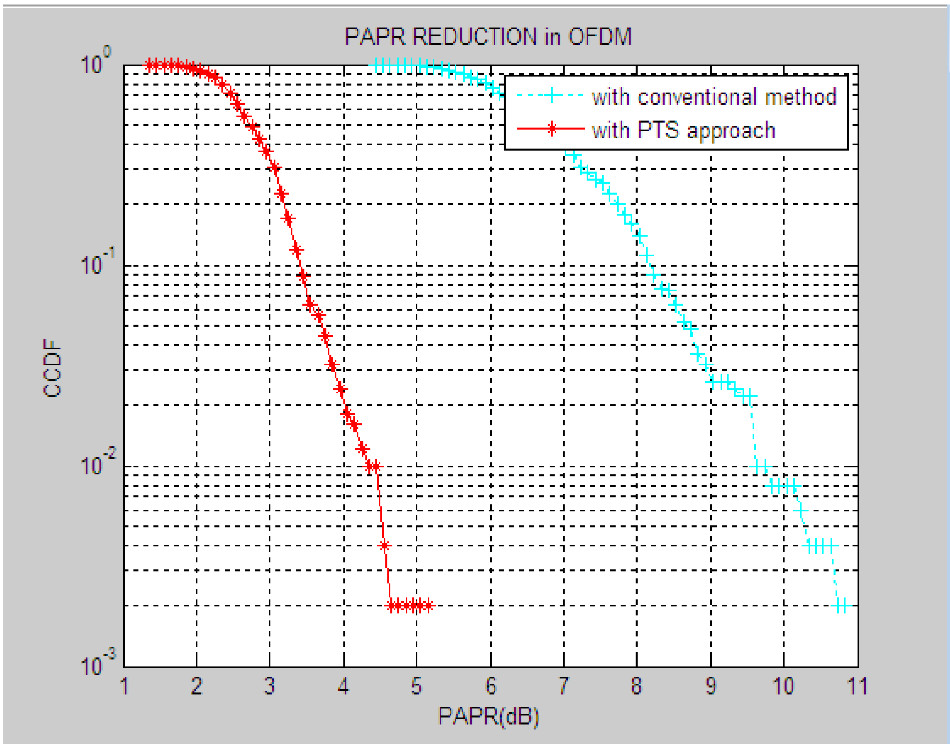

Figure 5 comparision PTS over conventional method

PERFORMANCE REPORT:

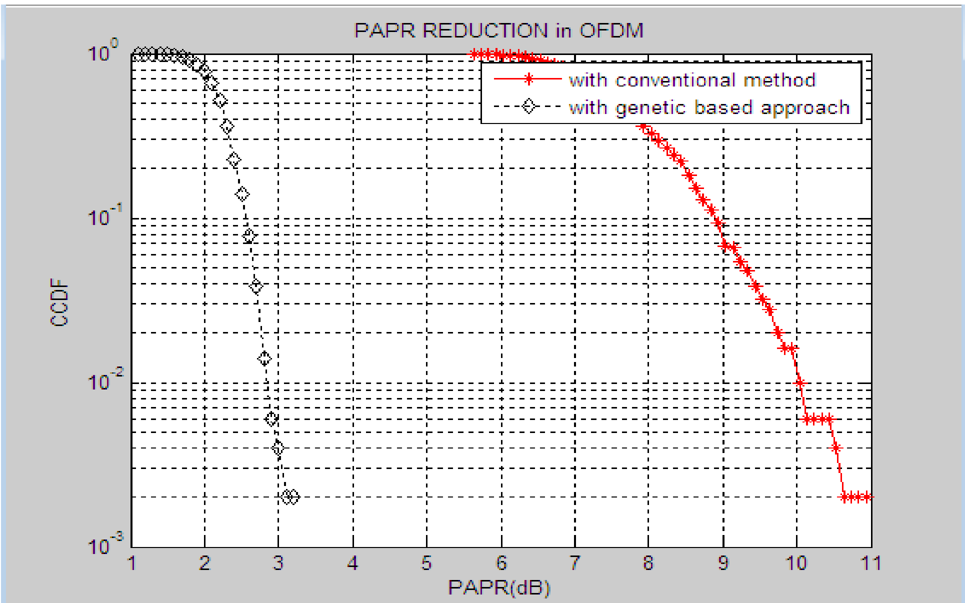

Figure 6 performance of genetic algorithm

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V. CONCLUSIONS AND FUTURE WORK

In our paper we perused the concept of covered the basic principles of GAs, the number of variations that have been suggested is enormous. Many variations in population size, in initialization methods, in fitness definition, in selection and replacement strategies, in crossover and mutation are obviously possible. We can add information such as age, or artificial tags, to chromosomes; in order to reduce complexity further.

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