LOW-COMPLEXITY PTS-BASED SCHEMES FOR PAPR REDUCTION IN SFBC MIMO-OFDM SYSTEMS

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ABSTRACT

The systems which have the high peak-to-average power ratio that is OFDM systems which degrades the performance of the amplifier. To overcome this, various distortion and distortion less algorithms are suggested. The Partial Transmit Sequence (PTS) is the technique that is distortion less which separates the sequences of input to the subsequences and selects minimize optimized PAPR in the signal to the transmission. To minimize the PAPR, further energy compaction of signal and minimum autocorrelation of data input sequences are essential which will be give by discrete cosine transform. The method which is suggested the Combine Discrete Cosine Transform (CCDCT) with PTS technique. The proposed scheme registers CDCT before and after PTS technique.

KEYWORDS: PAPR Reduction, Partial Transit Sequence, Combined Discrete Cosine Transform, Peak to Average ratio.

In signal processing the audio streams features are extracted in the front end of signal processing [Wang et. al., 2012]. A combined Discrete Cosine Transform is applied for this process. The orthogonal frequency division multiplexing (OFDM) used in MULTIPLE-INPUT multiple-output (MIMO) having the Space Frequency Block Coding (SFBC) method, the performance in time domain with the fading channels have substantial attention. However, the transmitters in SFBC MIMO-OFDM systems have a comparatively high procedure quality since they needed to perform one inverse Fast Fourier Transform (IFFT) operation for every transmission antenna. To cut back the system quality, time domain encryption approach has been planned however, the planned strategies square measure solely applicable to a fraction of far-famed SFBC encryption schemes and still have a high procedure quality [Chen et. al., 2011 & Tellado, 2000].

To get OFDM with success the link between all the carriers should be rigorously controlled to keep up the orthogonality of the carriers. For this reason, OFDM is generated by first of all selecting the Spectrum needed, supported the computer file, and modulation theme used [Bae et. al., 2010]. Every carrier to be created is allotted some knowledge to transmit. The specified amplitude and part of the carrier is then calculated supported the modulation theme (typically differential BPSK, QPSK, or QAM). The same definition of PAPR is applied to MIMO-OFDM systems. A high PAPR appears when a number of subcarriers of a given OFDM symbol are out of phase with each other [Wang and Ouyang, 2005 & Li et.al., 2010 & Ku et.al., 2010]. The right column indicates that the subcarriers are out of phase, which causes an increase in PAPR of about 2.5 dB compared to the subcarriers in the left column. Depending on the out-of-phase amount per subcarrier, the PAPR can vary up to its theoretically maximum of 10log10 (N) (dB) , where N is the number of subcarriers [Hou et.al., 2011 & Yang et.al., 2011].

COMBINED DISCRETE COSINE TRANSFORM

The CCDCT (Combined Discrete Cosine Transform) is a Fourier-like transform, which was first proposed by Ahmed et al. The idea to use the CCDCT transform is to reduce the autocorrelation of the input sequence to reduce the peak to average power problem and the transmitted signal does not require any side information at the receiver [Latinovic and Bar-Ness, 2006 & Wang and Li, 2009]. The one dimensional combine discrete cosine transforms (1D-CCDCT) M[i] is given by,

$$M[i] = \varphi[i] \sum_{n=0}^{N-1} w(n) \cos\frac{\pi(2n+}{2N} \quad (1)$$

For i = 0,1 . . . N- 1 , the inverse CCDCT is obtained by,

$$\varphi[i] = \frac{1}{\sqrt{N}}\ for\ i = \quad (2)$$

$$\varphi[i] = \frac{\sqrt{2}}{\sqrt{N}}, i = 1,2,\ldots N - \quad (3)$$

The basis sequences of the 1D CCDCT are real, discrete-time sinusoids are given by:

$$D_N[N,i] = \cos\frac{\pi(2n+}{2N} \quad (4)$$

The CDCT basis consists of the following N real sequences,

$$D_N[N,0], D_N[N,1], \ldots \ldots\ldots D_N[N,n - \quad (5)$$

$$M_N = D_N \varphi$$

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where M and φ are vectors with Nx1 matrix size and CN is a CCDCT transform matrix with N x N size. The rows (or column) of the CCDCT matrix CN are of orthogonal matrix vectors. This property of the CCDCT matrix is used to reduce the PAPR of OFDM signals. CCDCT can reduce the autocorrelation between the OFDM signals which is the one of the root cause to PAPR problem [12].

PROPOSED DESIGN

BER Vs SNR

The bit error rate (BER) is the number of bit errors per unit time. (i.e.) the bit error ratio is the number of bit errors divided by the total number of transferred bits during a studied time interval. While SNR (Signal to Noise Ratio) is the ratio of signal power to the noise power. From the graph, it is defined that the SNR value is decreases as the BER increases and it efficient when compared to existing system.

Technique

The proposed system contains two schemes such as CDCT before PTS and CCDCT after PTS. In PTS, the PAPR is reduced due to the reduction of similarity between the data bits. In order to reduce the PAPR even more, more reduction of similarity is required. Discrete Cosine transform is the technique which helps to reduce the autocorrelation between the data bits. In this proposed work CCDCT is applied before the PTS technique which reduces the autocorrelation between every modulated data bits. In this proposed work CCDCT is applied after the PTS technique which reduces the autocorrelation between the minimum PAPR OFDM signals.

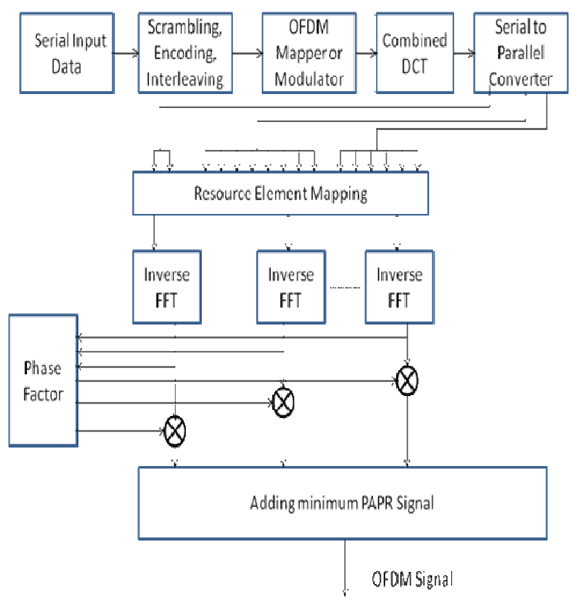
The proposed type I PTS scheme uses the conventional PTS scheme in each transmitting antenna. The proposed type II PTS scheme uses the combination of interleaving and adjacent SPMs to partition the input data block into sub blocks. Both proposed methods use the IFFT output of each sub block to generate cost functions for selecting samples, and only the selected samples are used to estimate the peak power of each candidate signal. In the proposed type II PTS scheme, we further use the correlation among sub blocks to reduce the computational complexity for generating cost functions and candidate signals, as well as the IFFT computation.

Combined CDCT before PTS

Combined Discrete Cosine Transform before the Partial Transmit Sequence. The application of CDCT reduces the autocorrelation of conventionally digital modulated data bits after that PTS technique is applied which scrambles the data using different phase factors. Here due to application of CDCT and data scrambling the similarity between the data bits are reduced which in turn reduces the PAPR problem. This proposed work is simulated which shows reduction in PAPR compared to conventional PTS technique.

Combined CDCT after PTS

In Figureure1, the conventionally modulated data bits are converted into parallel streams. The parallel converted data bits are applied to PTS technique which reduces the similarity between data by scrambling the data with 'm' number of phase factors. The signals with minimum PAPR are added using summer and the output is given to CCDCT block. The CDCT reduces the autocorrelation between the summed OFDM signals. The simulation result shows that the CDCT after PTS reduces PAPR compared to conventional PAPR. But CCDCT before PTS shows better performance compared to CDCT after PTS. This is because CDCT after PTS reduces only autocorrelation between minimum PAPR signals where as in the CDCT before PTS reduces the autocorrelation between each digital modulated data bits.



Figureure 1: Block diagram of the proposed method

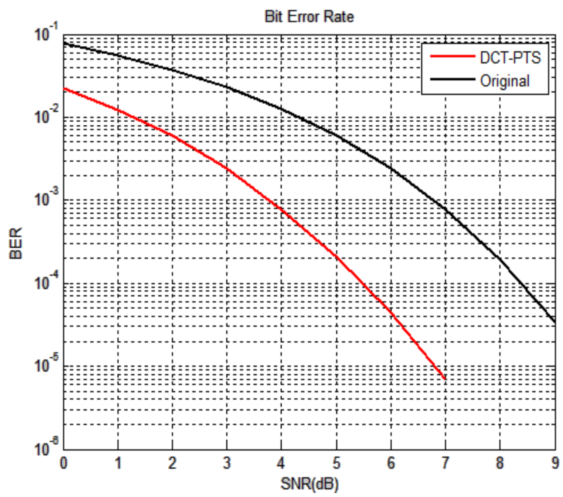
SIMULATION RESULTS

The Proposed work containing two parts such as:

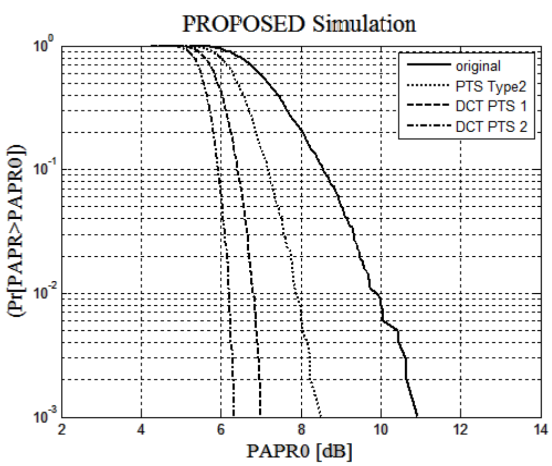
Combined Discrete Cosine Transform before the Partial Transmit Sequence. The application of CDCT reduces the autocorrelation of conventionally digital modulated data bits after that PTS technique is applied which scrambles the data using different phase factors.

CDCT after PTS technique. The conventionally modulated data bits are converted into parallel streams. The parallel converted data bits are applied to PTS technique which reduces the similarity between data by scrambling the data with ‘m’ number of phase factors.

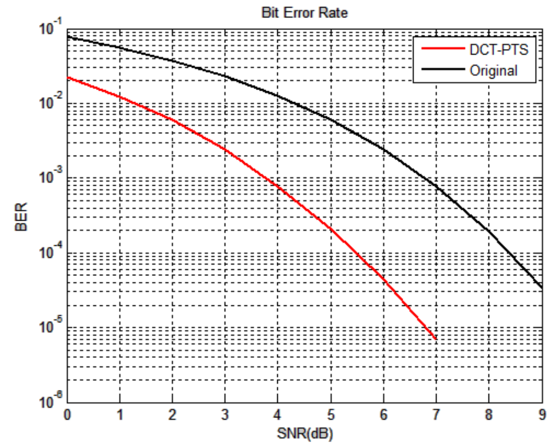
Figure 2 to Figure 5 graphs are shown the PAPR reduction by comparing conventional PTS with PAPR value before PTS and after PTS. The PAPR reduction value is reduced when compared with conventional PTS and therefore there is a difference of nearly 1 dB between CCDCT before PTS and CDCT after PTS.



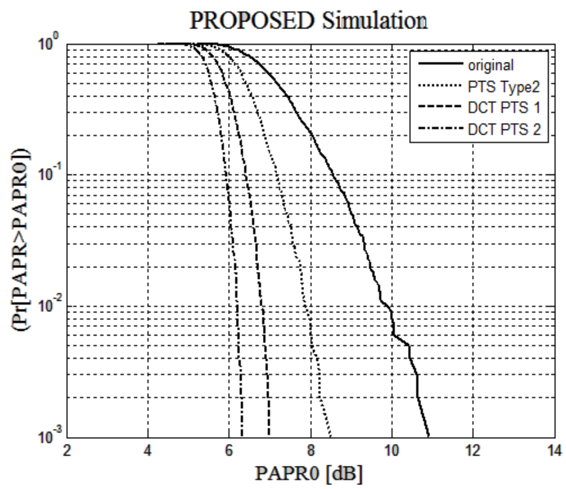
Figureure 2: OFDM system with PTS and CDCT before PTS



Figureure 3: OFDM system with CDCT after PTS



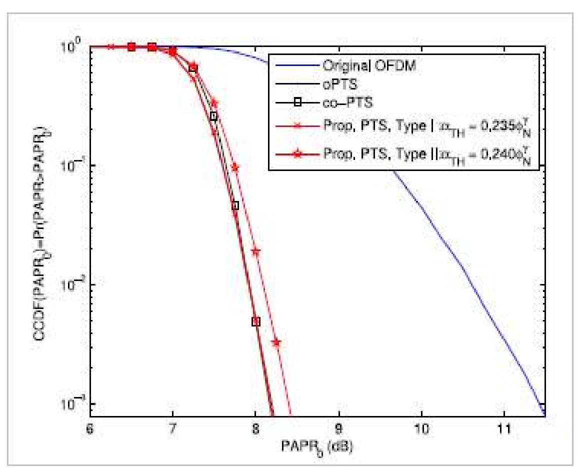
Figureure 4: OFDM system with PTS and CDCT before PTS



Figureure 5: OFDM system with CDCT after PTS

Comparison Results

The Figureure 6 showa the existing complementary cumulative distribution function (CCDF) of the PAPR for various PTS scheme in SFBC MIMO-OFDM systems.



Figureure 6: Comparison chart

The Proposed OFDM system is designed by using PTS technique in order to reduce PAPR. The applications of first order CDCT used before and after PTS which introduces orthogonality are simulated.

CONCLUSION

The OFDM system is designed by using PTS technique in order to reduce PAPR. The applications of first order CDCT used before and after PTS which introduces orthogonality are simulated. Simulation results show that, in SFBC MIMO-OFDM systems with two and four transmitting antennas, the proposed type I and type II PTS schemes can achieve a PAPR reduction performance and a BER performance close to those of the oPTS and the co-PTS schemes, but with much lower computational complexity.

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