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A Novel PAPR Reduction by Using Constant Modulus Algorithm



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ABSTRACT:

Here we provide the novel method to reduce the Peak to average power ratio(PAPR) by Constant Modulus algorithm. In first step, time domain signals from resource blocks may be linearly combined using precoding weights, transparent to the receiver. Next the precoding weights can be designed to minimize the modulus variations of the resulting signal, leading generally to a reduction in PAPR. In CMA We now propose an alternative formulation of this problem, by replacing the infinity norm by the average deviation of the OFDM block from a constant modulus signal.

INTRODUCTION:

Most of the SNR estimators proposed in the literature so far are related to single carrier transmission. In [1], a detailed comparison of various algorithms is presented, together with the derivation of the Cramer-Rao bound (CRB). Most of these algorithms can be directly applied to OFDM systems in additive white Gaussian noise (AWGN) [2], while the SNR estimation in frequency selective channels additionally requires efficient estimation of channel state information (CSI). In this paper, we propose an efficient algorithm for the average SNR estimation in wireless OFDM systems. The SNR per subcarrier can be additionally estimated using channel estimates and the estimated average SNR. The proposed estimator utilizes preamble structure, proposed by Morelli and Mengali in [3]. Compared to Schmidl and Cox synchronization method [4], it allows synchronization over a wider frequency offset range with only one preamble, hence reducing the training symbol overhead. Since the proposed estimation algorithm relies on the signal samples at the output of the FFT, its performance depends strongly on the given preamble structure.

ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING:

Principles of OFDM:

The OFDM technology was first conceived in the 1960s and 1970s during research into minimizing Inter-Symbol Interference, or ISI, due to multipath. OFDM is a special form of Multi Carrier Modulation (MCM) with densely spaced sub-carriers with overlapping spectra, thus allowing for multiple-access. MCM) is the principle of transmitting data by dividing the stream into several bit streams, each of which has a much lower bit rate, and by using these sub-streams to modulate several carriers. This technique is being investigated as the next generation transmission scheme for mobile wireless communications networks.

MULTIPLE ACCESS:

Multiple-access is a transmission scheme where several simultaneous users can use the same fixed bandwidth. Some other m-a schemes are TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access and CDMA (Code Division Multiple Access).

$$\int_a^b \varphi_m(t)\varphi_m^*(t)dt = 0, \quad (6)$$

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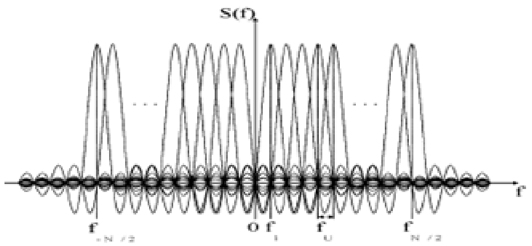
Where n ≠ m

OFDM Carriers:

As fore mentioned, OFDM is a special form of MCM and the OFDM time domain waveforms are chosen such that mutual orthogonality is ensured even though sub-carrier spectra may over-lap. With respect to OFDM, it can be stated that orthogonality is an implication of a definite and fixed relationship between all carriers in the collection. It means that each carrier is positioned such that it occurs at the zero energy frequency point of all other carriers. The sinc function, illustrated in Fig. 1 exhibits this property and it is used as a carrier in an OFDM system.



fu is the sub-carrier spacing

OFDM sub carriers in the frequency domain OFDM generation:

The orthogonal carriers required for the OFDM signal can be easily generated by setting the amplitude and phase of each bin, then performing the IFFT. Since each bin of an IFFT corresponds to the amplitude and phase of a set of orthogonal sinusoids, the reverse process guarantees that the carriers generated are orthogonal.[7].

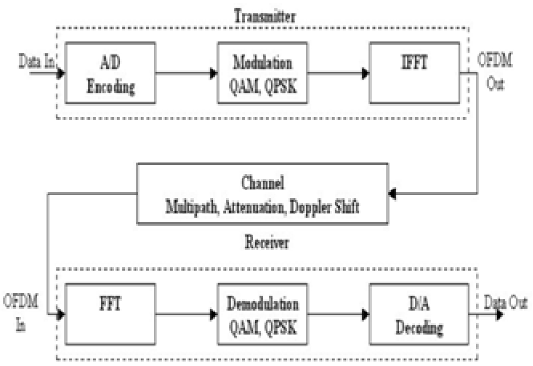
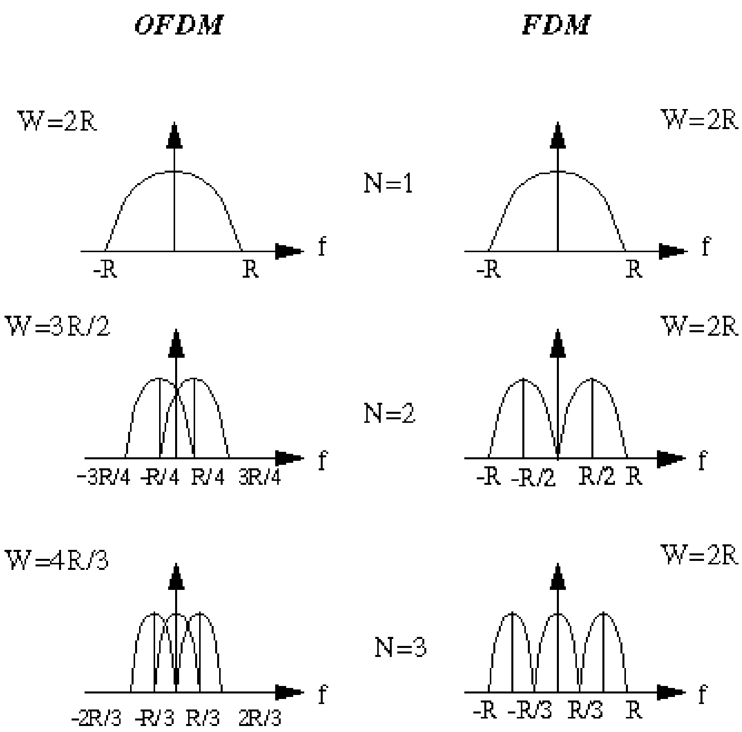


Figure. OFDM block diagram

Figure shows the OFDM block diagram. The signal generated is a baseband, thus the signal is filtered, then stepped up in frequency before transmitting the signal.

Power spectral density of OFDM:

As mentioned above, the transmission is generated in such a way that the carriers used are orthogonal to one another, thus allowing them to be packed together much closer than standard FDM as seen in Fig.5, where W is the bandwidth and N is the number of carriers. From the figure above, it is seen that the OFDM signal requires less bandwidth as the number of carriers is increased. This means that OFDM also has a high spectral efficiency.



PSD of OFDM and FDM:

The associated harmonically related frequencies can be used as the set of sub channel carriers as required by an OFDM system. Now all sub channels are modulated and demodulated in one IFFT step.

EXISTING SYSTEM:

A well-known drawback of OFDM is that the amplitude of the time domain signal varies strongly with the transmitted symbols modulated on the subcarriers in the frequency domain.

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If the maximum amplitude of the time domain signal is too large, it pushes the transmit amplifier into a non-linear region which distorts the signal resulting in a substantial increase in the error rate at the receiver. To eliminate the error rate here we produce the PAPR reduction. In existing different algorithm are implemented such as SDCMA, CP-PTS, UC-CMA. Less complexity. Highly reduced PSNR value compared to previous works.

PROPOSED SYSTEM:

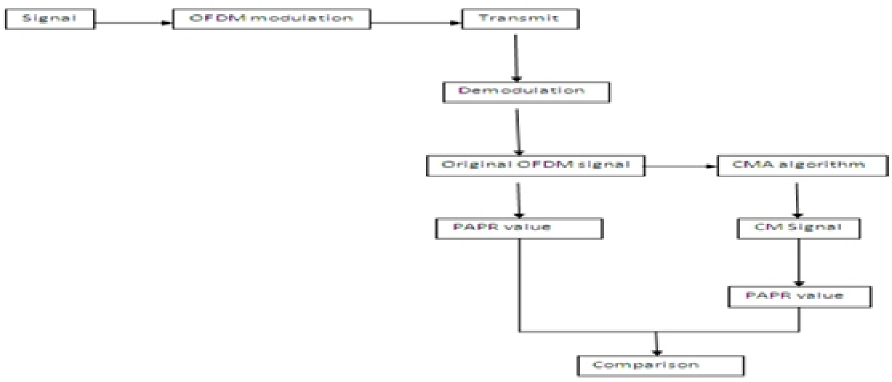
Here we provide the novel method to reduce the Peak to average power ratio(PAPR) by Constant Modulus algorithm.

In first step, time domain signals from resource blocks may be linearly combined using precoding weights, transparent to the receiver. Next the precoding weights can be designed to minimize the modulus variations of the resulting signal, leading generally to a reduction in PAPR.

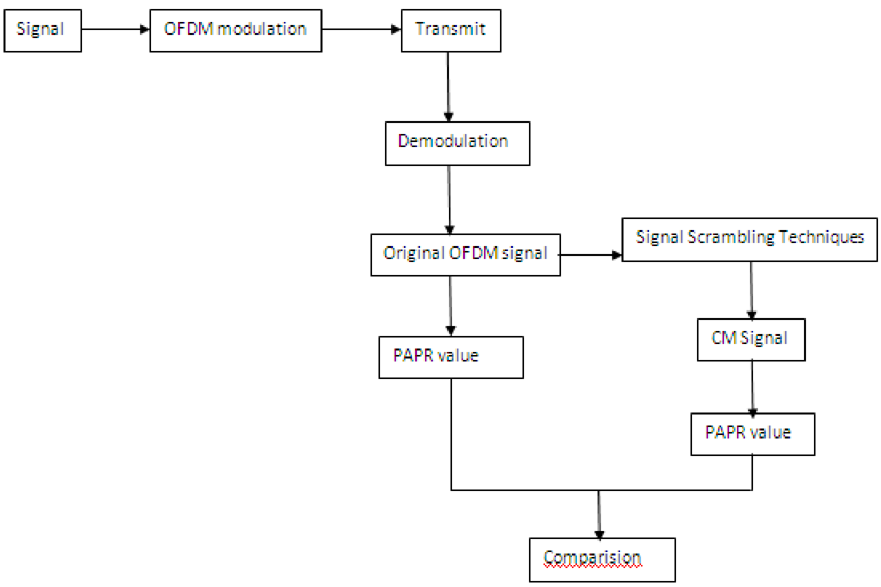
In CMA We now propose an alternative formulation of this problem, by replacing the infinity norm by the average deviation of the OFDM block from a constant modulus signal.

SYSTEM ARCHITECTURE

Module1:



Module2:



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SIGNAL GENERATION:

•OFDM is the abbreviation for Orthogonal Frequency Division Multiplexing.
•Thus describes a digital modulation scheme that distributes a single data stream over a large number of carriers for parallel transmission.
•These carriers are called the subcarriers of the signal.
•In the frequency domain, they are equally spaced around a central RF carrier.
•The primary advantage of OFDM over single-carrier schemes is its ability to cope with severe channel conditions.
•Channel equalization is simplified because OFDM may be viewed as using many slowly modulated narrowband signals rather than one rapidly modulated wideband signal.

PACKET ALLOCATION:

•An OFDM block with subcarriers is transmitted from each antenna.
•The subcarriers include useful subcarriers surrounded by two guard bands with zero energy.
•The useful subcarriers are further grouped into resource blocks (RBs) each consisting of subcarriers.
•Data of one or more users is placed in these RBs and mapped into the space-time domain using an inverse discrete Fourier transform (IDFT) and space-time block coding (STBC).
•To allow channel estimation at the receivers (mobile stations), each RB also contains several pilot subcarriers that act as training symbols.

CMA ALGORITHM:

•The Constant Modulus Algorithm(CMA) is a method to update the covariance matrix of this distribution.
•This is particularly useful, if the function is ill-conditioned.

•Adaptation of the covariance matrix helps in learning a second order model of the underlying objective function.

•In contrast to most classical methods, fewer assumptions on the nature of the underlying objective function are made.

•Only the ranking between candidate solutions is exploited for learning the sample distribution and neither derivatives nor even the function values themselves are required by the method.

SIGNAL SCRAMBLING TECHNIQUE:

•Partial transmit sequence (PTS) combining can improve the PAPR statistics of an OFDM signal.

•The input data vector is partitioned into disjoint sub blocks.

•Simple partioning mechanisms are used to split the data vector into sub blocks which consists of contiguous set of subcarriers.

•They are combined to minimize the PAPR.

PAPR REDUCTION:

•PAPR is reduced by designing precoding weights that minimize the modulus variations of the resulting signal.

•For this Steepest-Descent CMA(SDCMA) and Unit-Circle CMA (UC-CMA) algorithm is used .

•The SDCMA is a block-iterative algorithm in which we act on the full data matrix and update until it converges.

PERFORMANCE ANALYSIS:

•The performance is analyzed using Complementary Cumulative Distribution Function (CCDF) Plot.

•The CCDF graph displays the probability of the generated waveform's calculated peak-to-average power ratio meeting or exceeding a certain level.

•Our algorithm gives a efficiency above 90%

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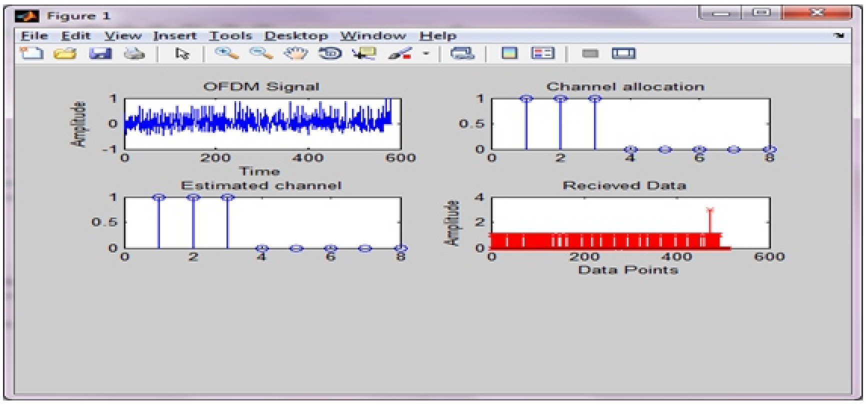
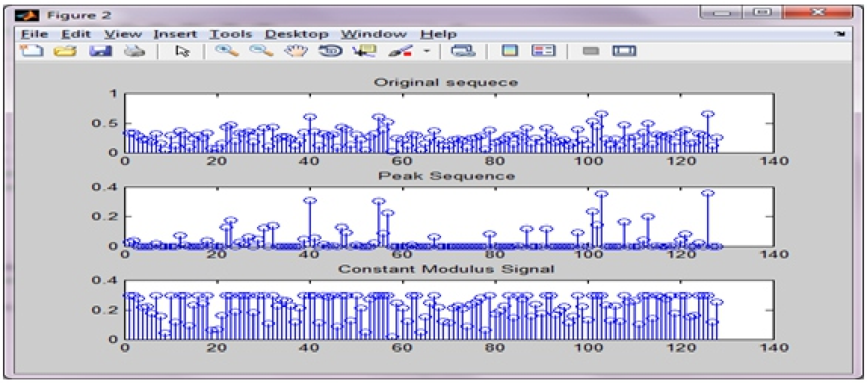
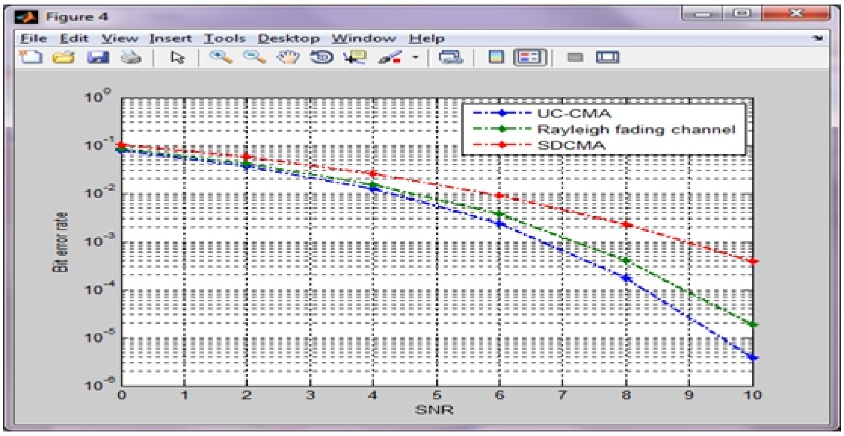
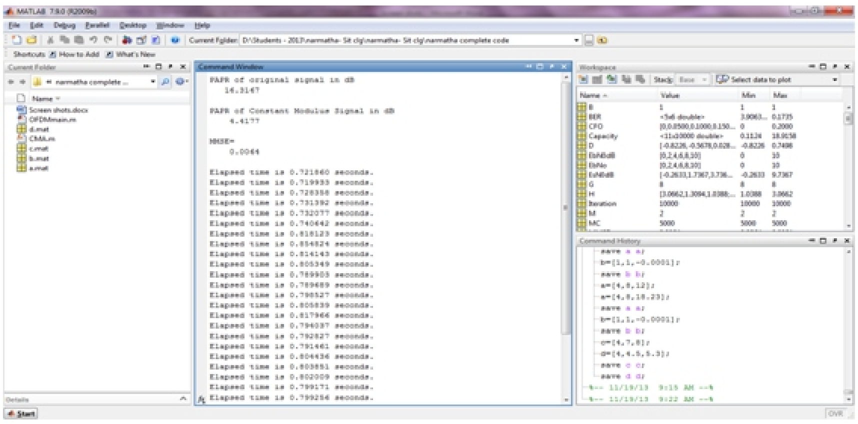
SIMULATION RESULTS









CONCLUSION:

We have proposed a method to reduce the PAPR value of the MIMO OFDM signal. Here we reduce the PAPR value to reduce the error in the receiver side. For this here we are using Constant Modulus Algorithm. It provides the better result.

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