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QOSFBC BASED FOUR CHANNEL INTERFERNCE CANCELLATION USING PAPR

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ABSTRACT: Multicarrier systems suffer from a high peak-to-average power ratio (PAR) of their transmit signal as large signal peaks lead to power inefficiency of the amplifiers. This issue becomes even more serious in a multi-antenna transmitter. To increase power efficiency, a PAPR reduction scheme must be applied at the transmitter. The high data rate transmission is the today's most demanding parameter hence one of the popular technique used in the communication is OFDM. Partial transmit sequence (PTS) combining can improve the PAPR statistics of an OFDM signal. For PTS, the search complexity increases exponentially with the number of subblocks. Here, we present a new algorithm for computing the phase factors that achieves better performance than the exhaustive bi-nary search approach.

A good PAPR reduction is also obtained by the use of modified SFBC, modified Quasi-orthogonal SFBC (QOSFBC) and modified SFBC with Frequency Switched Transmit Diversity (FSTD) instead of conventional SFBC, QOSFBC and SFBC with FSTD because the use of conventional schemes destroys the low PAPR property .We also investigate the effects of non-linear amplifiers on the performance of the new algorithm, including the power spectral density and in-band distortion.

Keywords: MIMO, Interference Alignment (IA),Llyods Algorithms.

I. INTRODUCTION

The use of multiple antennas at the transmitter and receiver in wireless systems, popularly known as MIMO (multiple-input multiple-output) technology, has rapidly gained in popularity over the past decade due to its powerful performance-enhancing capabilities. Communication in wireless channels is impaired predominantly by multi-path fading. Multi-path is the arrival of the transmitted signal at an intended receiver through differing angles and/or differing time delays and/or differing frequency (i.e., Doppler) shifts due to the scattering of electromagnetic waves in the environment. Consequently, the received signal power fluctuates in space (due to angle spread) and/or frequency (due to delay spread) and/or time (due to Doppler spread) through the random superposition of the impinging multi-path components. This random fluctuation in signal level, known as fading, can severely affect the quality and reliability of wireless communication. Additionally, the constraints posed by limited power and scarce frequency bandwidth make the task of designing high data rate, high reliability wireless communication systems extremely challenging.

MIMO technology constitutes a breakthrough in wireless communication system design. The technology offers a number of benefits that help meet the challenges posed by both the impairments in the wireless channel as well as resource constraints. In addition to the time and frequency dimensions that are exploited in conventional single-antenna (single-input single-output) wireless systems, the leverages of MIMO are realized by exploiting the spatial dimension (provided by the multiple antennas at the transmitter and the receiver). The advantages of multiple-input multiple-output (MIMO) systems have been widely acknowledged, to the extent that certain transmit diversity methods (i.e., Alamouti signaling) have been incorporated into wireless standards. Although transmit diversity is clearly advantageous on a cellular base station, it may not be practical for other scenarios. Specifically, due to size, cost, or hardware limitations, a wireless agent may not be able to support multiple transmit antennas. Examples include most handsets (size) or the nodes in a wireless sensor network (size, power).

II. RELATED WORKS

[1] For Time-Correlated MIMO on the minimum differential feedback Rayleigh Block-Fading Channels. In this the differential feedback rate is derived with the presence of channel estimation errors and quantization distortion. Lloyd's algorithm used to increase the ergodic capacity [2] Cooperative Algorithms for MIMO Interference Channels. For MIMO Interference channels INL (Interference Pulse noise leakage) algorithm is introduced. When the noise is specially white and negligible. The transmit pre coders and receive spatial filters can jointly optimizes using joint minimum mean square error .[3] Achieving the Welch Bound With Difference Sets. By considering a codebook having N unit-norm complex vectors and K dimensional space. The maximal cross-correlation amplitude (Imax) is minimized by the code book is often. Analytical optimal codebook meeting were constructed in the case of Welch lower bound numerical search method developed.

[4] Beam Tracking is used for Interference Alignment in MIMO Interference Channels which is slowly fading. Beam tracking algorithm is developed based on linear formulation for interference alignment to reduce the fading in the beam design for the signal space interference alignment. It computes the current time beam interference-aligning beam forming vectors based on previous vectors . During the predictively updating phase it consider the channel difference between two time steps , and yields significant reduction for the calculation.[5] Interference Alignment with Limited Feedback. For single-antenna interference networks

operating over time-selective channels and showed that this scheme achieves full spatial multiplexing gain. This depends, critically on the assumption of every source and related destination knowing all the channels in the network perfectly result.

III. EXISTING METHOD

Consider interference cancellation for a system with two users when users know each other channels. The goal is to u Consider interference cancellation for a system with two users when users know each other channels. The goal is to utilize multiple antennas to cancel the interference without sacrificing the diversity or the complexity of the system. Before, in the litertilize multiple antennas to cancel the interference without sacrificing the diversity or the complexity of the system. Before, in the literature, it was shown how a receiver with two receive antennas can completely cancel the interference of two users and provide a diversity of 2 for users with two transmit antennas.

In OFDM systems, a fixed number of successive input data samples are modulated first (e.g. PSK or QAM), and then jointly correlated together using IFFT at the transmitter side. IFFT is used to produce orthogonal data subcarriers. Mathematically, IFFT combines all the input signals (superposition process) to produce each element (signal) of the output OFDM symbol. The AM/AM and AM/PM characteristics of this PA are shown in Fig. 1. Fig. 1a and 1b show the AM/AM and AM/PM characteristics of the power amplifier with memory effects respectively. As it can be observed, the impact of memory causes these curves to spread over their linear behavior. The type of memory effects that cause these effects is electrical memory effects or also called short term effects and the power amplifier for modeling it, is based on the specific case of Volterra series [9]. This memory effect causes spectrum broadening.

IV. PROPOSED SYSTEM

Assume a quasi-static flat Rayleigh fading channel model. The path gains are independent complex Gaussian random variables and are fixed during the transmission of one block. In addition, a short-term power constraint is assumed. For the sake of simplicity, The scheme for four users each with four transmit antennas and one receiver with four receive antennas. By adjusting the dimensions of channel matrices, The proposed scheme can be easily applied to Jusers with Jtransmit antennas and one receiver with Jreceive antennas.

The proposed system to achieve the maximum possible diversity of 4 with low complexity. Then, extend the results to two-user systems with any number of transmit and receive antennas. The main idea is to design precoders, using the channel information, to make it possible for different users to transmit over orthogonal spaces. Then, using the orthogonality of the transmitted signals, the receiver can separate them and decode the signals independently. The analytically prove that the system provides full diversity to both users.

BLOCK DIAGRAM

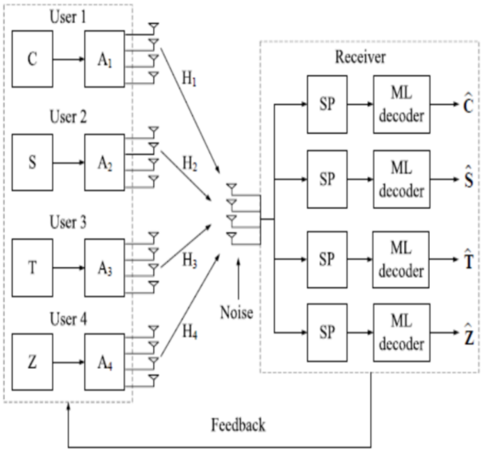


Fig.1 Block diagram of proposed method

We consider a MIMO system having K-user over time correlated block-fading channels as shown in figure. Assume that each transmitter S_i (i value varies from 1 to K) has *Nt* antennas and each receiver D_i (i value varies from 1 to K)has *Nr* antennas.

The ith transmitter $S_i$transmits$d_i$independent spatial data streams to its corresponding receiver D_i. The block-fading channel coefficients $\mathbf{H}_{ik}(n)$, i, k = 1, 2, . . . , K are constant throughout the time interval and temporal correlated with each other in different block indexes n.

SYSTEM MODEL

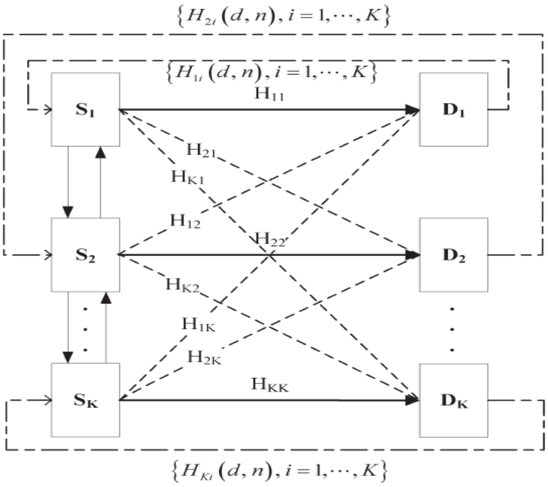


Fig.2 MIMO system having K users

Thus, the received signal at the ith receiver can be written as

$$y_i(n) = H_{ii}(n)X_i(n) + \sum_{k\neq i} H_{ik}(n)X_k(n) + n_i(n)$$
$$i = 1,2,\ldots K$$

y_i denotes a N_r x1 received signal vector, H is a N_r x N_t channel fading matrix with independent entries obeying complex Gaussian distribution $CN(0,\sigma_h^2)$ and x represents a N_t x 1 transmitted signal vector . n0 is a N_r x 1 noise vector whose entries are i.i.d complex Gaussian variables satisfying $\mathbb{CN}(0,\sigma_0^2)$.

The time-correlated channel is represented by first order autoregressive model(AR1). The channel fading matrix can be written as

$$H_n = \alpha H_{ik}(n-1) + \sqrt{1-\alpha^2} W_{ik}(n)$$

Where H_n denotes the n-th channel fading matrix, W_n is a noise matrix, which is independent of H_{n-1} and the entries are i.i.d complex Gaussian variables with $\mathbb{CN}(0,\sigma_h^2)$. The parameter α is time correlation coefficient, which is given by the zero-order Bessel function of first kind $\alpha = J_0(2\pi f_d \tau)$ where f_d stands for the maximum Doppler frequency and τ denotes the time interval between consecutive feedback messages. τ denotes the time interval between two consecutive feedback messages.

We assume that $Hik(n)$ is perfectly estimated by the receiver, and the feedback channels are error free but not noiseless. Thus, the output of the feedback channel can be expressed as

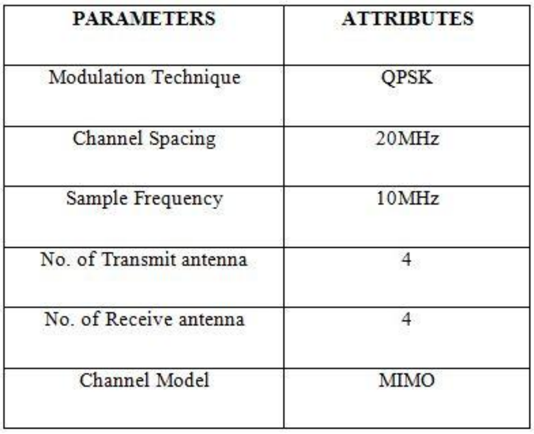
$$H_{ik}(n) = \bar{H}_{ik}(n) + E_{ik}(n)$$

where$\bar{H}_{ik}(n)$ denotes the quantized channel matrix with i.i.d. entries, and $\mathbf{E}_{ik}(n)$ is the quantization error, with entries following an i.i.d. complex Gaussian distribution It can be rewritten as

$$\bar{H}_{ik}(n) = \frac{(\sigma_h^2 - \delta_d)}{\sigma_h^2 H_{ik}(n)} + \phi_{ik}(n)$$

Where $\phi_{ik}(n)$ is independent of $H_{ik}(n)$, and the entries are i.i.d complex Gaussian variables with $\mathbb{CN}(0,(\sigma_h^2 - \delta_d)\delta_d/\sigma h2$.

V. RESULT



PARAMETERS	ATTRIBUTES
Modulation Technique	QPSK
Channel Spacing	20MHz
Sample Frequency	10MHz
No. of Transmit antenna	4
No. of Receive antenna	4
Channel Model	MIMO

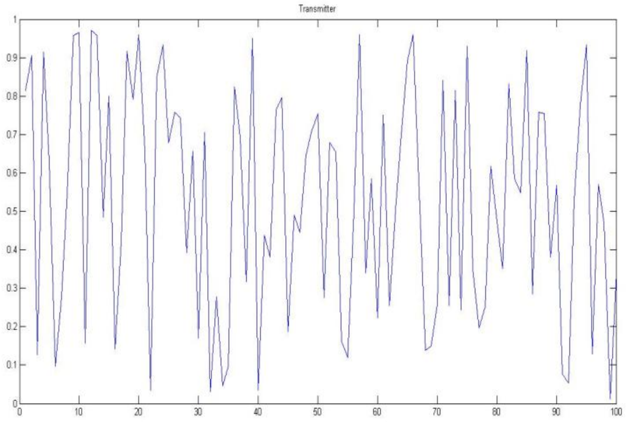


Figure 5.2 Transmitter-Random Signals

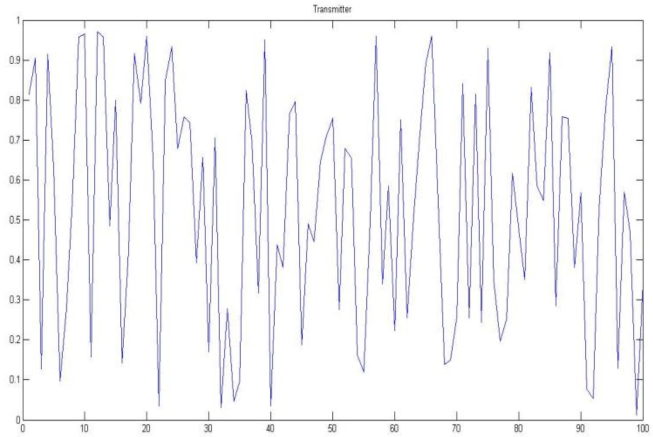


Figure 5.3 Transmitter with AWGN

AWGN-Additive White Gaussian Noise

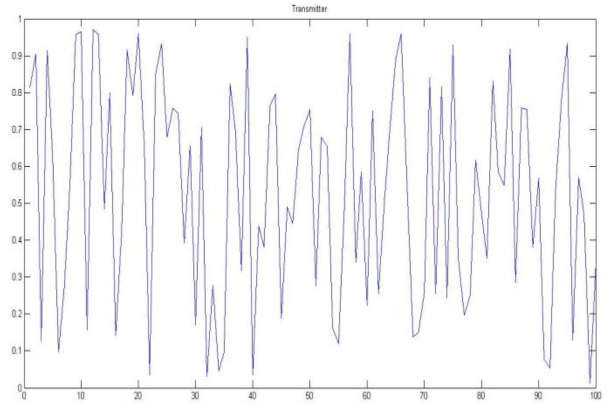


Figure 5.4 Transmitter with another AWGN

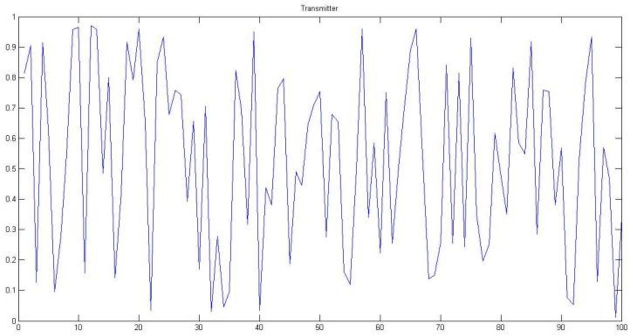
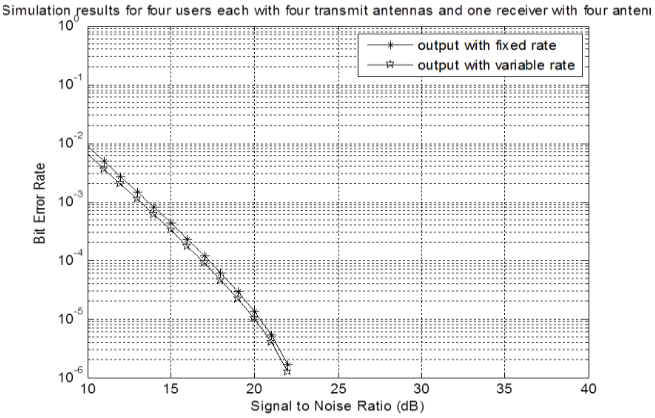


Figure 5.5 Receiver without Disturbance (After Interference cancellation)



VI. CONCLUSION

A single-carrier transmission scheme that is able to achieve full diversity when considering a distributed QOSFBC signal has been constructed for uplink communications. Considering the limited size and computational complexity of mobile devices, the proposed scheme uses only two transmit antennas at the source node, and generates a distributed SFBC signal employing four transmit antennas in collaboration with the relay node, which utilizes only a single transmit antenna. A phase rotation strategy has been devised at the relay node to effectively enhance the BER performance under frequency selective fading channel environments. In addition, a modified SFBC encoding method is proposed to enhance the PAPR performance. Consequently, the proposed scheme is able to provide a full-diversity order, reduced PAPR values, and low-Complexity receivers without additional computations for the mobile devices.

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