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Future Mobile Communications Reaching For Ever Increasing Data Rates OFDM & MC-CDMA technique System

Rubi Gupta and Prof Ranjeet Prajapati

Department of Electronic and Communication Engineering,
RITS, Bhopal, (MP), India

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ABSTRACT: A MC-CDMA system can be configuration play important role in performance improvement in transmitter and receiver. One configuration is transmit/receive diversity (TRD) which has been widely used due to its simplicity and good performance in huge load traffic. The performance of MC-CDMAsystems with optimal TRD depends on their operational environments. By providing the receiver with multiple copies of the transmitted signal in space, MC-CDMAsystems achieve spatial diversity and effectively mitigate multipath fading, thereby improves the quality and performance of the receiver. The desired spatial diversity order depends on the channel diversity, specially, the channel interference. In a big scattering environment, a transmitter with an antenna array may transmit multiple independent data streams within the bandwidth of operation, and the receiver with an antenna array can successfully separate the data streams. MC-CDMAsystems, therefore, Oder an increase in data rate through spatial multiplexing. Multipath scattering is commonly seen as detrimental to wireless communications. However, with the emergence of MC-CDMAsystems, multipath have been effectively converted into a benefit for wireless communications. Due to this big advantage, MC-CDMAtechnology is considered key to future of wireless communications. After analyzing the shortcomings of current feature extraction and fault diagnosis technologies, a new approach based on wavelet packet decomposition (WPD) and empirical mode decomposition (EMD) are combined to extract fault feature frequency and neural network for rotating machinery early fault diagnosis is proposed. Acquisition signals with fault frequency feature are decomposed into a series of narrow bandwidth using WPD method for de-noising, then, the intrinsic mode functions (IMFs), which usually denoted the features of corresponding frequency bandwidth can be obtained by applying EMD method. Thus, the component of IMF with signal feature can be separated from all IMFs and the energy moment of IMFs is proposed as eigenvector to effectively express the failure feature. The classical three layers BP neural network model taking the fault feature frequency as target input of neural network, the 5 spectral bandwidth energy of vibration signal spectrum as characteristic parameter, and the 10 types of representative rotor fault as output can be established to identify the fault pattern of a machine. Lastly, the fault identification model of rotating machinery with rotor lateral early crack based on BP neural network is taken as an example. The results show that the proposed method can effectively get the signal feature to diagnose the occurrence of early fault of rotating machinery.

Keywords: MC CDMA,TRD, Fading, EMD method, energy moment of IMFs

I. INTRODUCTION

The increasing rate of wireless communication, demand the efficient and quality oriented process for transmitter and receiver. Analysis of transmitter or receiver diversity has been conducted over the last several decades to characterize the performance of different diversity-combining methods for different numbers of antennas and different fading distributions. For a point-to-point communication link without CCI, it is well-known that maximal-ratio combining (MRC) is the optimal combining technique in terms of maximizing the signal-to-noise power ratio (SNR) at the combined output. Several recent works have investigated the performance of MRC diversity with a single transmit antenna and multiple receive antennas in the presence of CCI.

The study of arbitrary-power interferers for SIMO systems was considered in [7-10]. In particular, [7] derives the outage probability (Pout) of MRC in a SIMO system with CCI assuming Nakagami, Rice or Rayleigh fading for the desired signal and Rayleigh fading for the CCI. A different approach, where the distribution of the total CCI is not needed, was proposed in [8,9,10] to compute Pout. MC-CDMA system configuration is transmit/receive diversity (TRD) which has been widely used due to its simplicity and good performance. The TRD systems are a kind of wireless systems including traditional receive diversity as one of its important section The performance of optimal TRD systems depends on their working scenario for both condition without or with co-channel interferences, and the treatment is mainly focused on the classical Rayleigh or Rician fading channels.

In particular, performance analysis in a Rayleigh fading environment without co-channel interference was first treated by Dighe *et al.* [11] by assuming that the MC-CDMA channels follow independent and identical (i.i.d.) Rayleigh distribution. The resulting outage probability is expressible in the form of a determinant. Bandwidths efficient way to introduce diversity is to use several transmits and/or receive antennas. To use antenna diversity at the receiver is straightforward, because the channel can be estimated from the received data. To use transmit antenna diversity is, however, more cumbersome because the channel is not readily available at the transmitter. The rest of paper is organized as follows. In Section II, the system model for MC CDMA. correlated faded model. Section V present the comparison of the result SIR and outage probability gives the simulation results followed by a conclusion in Section V. The basic approach for constructing features is to compute a number of general statistical parameters from time series such as the median, the mean, the standard deviation and higher-order moments. However, when restricting oneself to a limited number of parameters in advance, important information may be lost due to the implicit assumptions behind these parameters, e.g., the mean and standard deviation are only sufficient to characterize signals that and frequency bands, to reduce energy consumption. For the physical layer, different transmission techniques have been reconsidered from the EE point of view instead of traditional SE. Some cross-layer approaches have also been developed to obtain more gain over the independent layer design [3]. In this article, we will mainly focus on techniques in physical and MAC layers.

Cross-layer EE optimization in time, frequency, and spatial domains has been discussed in [3] while four fundamental tradeoffs, including deployment efficiency energy efficiency tradeoff, spectral efficiency energy efficiency tradeoff, bandwidth - power tradeoff, and delay - power tradeoff, have been studied in [4]. Different from them, we will discuss these topics from the perspective of how to develop specific energy efficient techniques. Specifically, in fundamentals on energy-efficient communications are first introduced, including the information-theoretic bounds and the impact of some practical issues multiple access techniques considering EE are discussed, where the design of energy-efficient OFDMA systems is emphasized since a comprehensive survey on EE in code division multiple access (CDMA) networks has been presented in [5]. Next, some advanced techniques, including MIMO and relay, will be elaborated. Although these techniques can improve SE significantly, high expense is also paid, including additional configuration of antennas or relay stations and additional energy consumption. How to design energy-efficient MIMO and relay systems will be provided in we will discuss signaling design considering EE.

II. SYSTEM MODEL

We design System model of MC-CDMA with t antenna elements at the transmitter and r antenna Elements at the receiver. It is assumed that the system is interference-limited, and there are a total of interfering users each equipped with ti antenna elements, i = 1The received r × 1 vector at the desired user's receiver can thus be modeled as

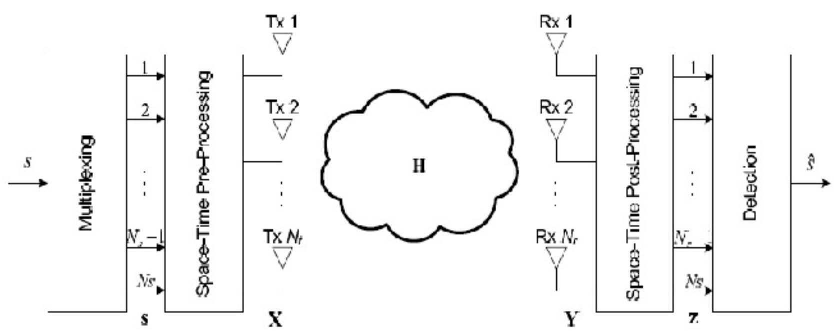

Fig. 1. **Shows that block diagram of MC-CDMA System.**

Power and its distribution among sub carriers. It is demonstrated that there is at least a 15% reduction in energy consumption when frequency diversity is exploited. Energy-efficient design has been also extended to general OFDMA networks [9]. For uplink transmission with flat fading channels, it is shown that using adaptive modulation, the EE increases as the user moves towards the BS, and the closer the user is to the BS, the higher the modulation order should be. In an interference-free environment, a tradeoff between EE and SE exists for increasing transmit power always improves SE but without guarantee of EE improvement. However, in multi-cell interference limited scenarios, increasing transmit power even does not necessarily benefit SE due to the associated higher interference to the network. In [2], energy-efficient design in multi-cell scenarios with inter-cell interference is studied.

As shown there, energy-efficient power distribution not only boosts system EE but also refines the EE-SE tradeoff due to the conservative nature of power allocation, which sufficiently restricts interference from other cells and improves network throughput. The existing research on energy-efficient OFDMA has jointly to achieve desirable EE. Tradeoff between EE and SE: Since EE and SE are two important system performance indicators, the tradeoff between EE and SE for general OFDMA networks should be exploited to guide system design. The bounds and achievable EE-SE regions for downlink OFDMA networks are important for system designer. Meanwhile, proper utility function should be investigated for locating the optimum operating point.

$$f(\alpha) = \begin{cases} \frac{\alpha}{\sigma^2} e^{-\frac{\alpha^2+A^2}{2\sigma^2}} I_0(\frac{A\alpha}{\sigma^2}), & \alpha \geq 0 \\ 0, & \alpha < 0 \end{cases}$$

Its probability density function is given by been widely adopted in wireless networks Single-output (SISO), single-input multiple-output (SIMO), and multiple-input single-output (MISO) can be regarded as special cases of multiple-input multiple-output (MIMO). MIMO can also be used with single user or multiple users to form single-user MIMO (SU-MIMO), multi-user MIMO (MU-MIMO), and coordinated multipoint transmission (CoMP). It has been demonstrated in these specifications that spatial DOF from configuration of multiple antennas enhances both reliability and capacity. For example, in the downlink of 3GPP LTE, both SU-MIMO modes and MU-MIMO modes are supported, and different modes can be selected according to the specific requirement. In 3GPP LTE-Advanced, CoMP techniques have been proposed to further improve the throughput of cell edge users and the coverage. Although MIMO techniques have been shown to be effective in improving capacity and SE of wireless systems, energy consumption also increases. First of all, more circuit energy is consumed due to the duplication of transmit or receive antennas. Depending on the ratio of the extra capacity improvement and the extra energy consumption, the EE of a multiple antenna system may be lower than that of a single antenna system. Moreover, more time or frequency resources are spent on the signaling overhead for MIMO transmission. For example, in most of MIMO schemes, CSI is required at the receiver or at both the transmitter and the receiver to obtain good performance. In order to estimate the CSI and feed it back to the transmitter, some training symbols need to be sent before the data transmission. Since the number of channel coefficients increases with the product of the number of transmit antennas and that of receive antennas, much more signaling overhead is required for MIMO systems. The EE of MIMO systems is still unknown if all the overhead is considered.

IV. CORRELATED FADING

We assumed that the fades between different antenna pairs are independent of each other. We will now consider the situation when the fading between antenna pairs is correlated. While the results we obtained for the independent fading case holds for any distribution of the individual , the results we present here for the systems in the (a) pulse ofdm psk2 15.2 db and (b) MB Ofdm psk2 20.3db(c) Modified psk2 27.db SNR Improve signal and reducing the power consumption channels. An exact method for calculating the bit error rate of pulse-systems in the presence of frequency offset is derived. correlated case are only for the case of a Rayleigh-fading model. Each of are assumed to be complex, zero-mean, circular symmetric Gaussian random variables with variance [8, 10]. They are jointly Gaussian with the following covariance structure: where and are by covariance matrices. This fading model embodies three assumptions [14]. The correlation between the fading from transmit antennas P and q to the same receive antenna is and does not depend on the receive antenna; describes the transmit correlation. The correlation The product-form assumption is made for analytical tractability and can be thought of as a first order approximation of the correlation structure when the fading from two transmit antennas to the same receive antenna and the fading from two receive antennas to the same transmit antenna is much more highly correlated than that between two distinct antenna pairs.

V. SIMULATION AND EXPERIMENTAL RESULT ANALYSIS

The validity of diversity with correlated fading using Rayleigh model has been rigorously examined by showing that they include most of existing results in different antenna diversity. The evaluation of performance is measured by outage probability and signal interference ratio. [13]. we assume that the receiver is equipped with antennas for the reception of Rayleigh faded signals from intended transmit antennas. The received signals are corrupted by Rayleigh faded interference from interferers. Simulation results are also included for comparison. Each point in the simulated curves is produced by averaging over at least 100 000 independent computer runs. Throughout this section, we set t = 4 and r = 2, and assume that the correlation at the intended transmit and receive ends is characterized.

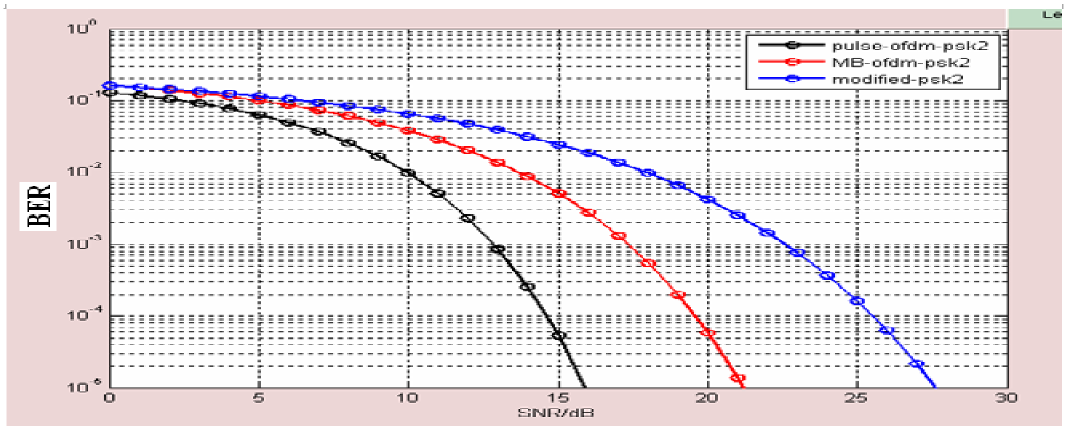

Fig. 2.

Fig. 2 shows that to transmit 110 Mb/s of information, the MB-OFDM system uses phase-shift keying (PSK) is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. The simplest PSK is binary PSK (0s and 1s) information. With this scheme, the "1" is called the mark frequency and the "0" is called the space frequency. The time domain of a PSK modulated carrier is illustrated in the figures to the right. Signal Studio for UWB produces a digital version of the base band I and Q waveforms that get loaded into test equipment to generate [11]. UWB radio frequency signals. The easy-to-use interface lets you get started quickly, enabling you to focus on the evaluation of the UWB transceiver and perform key measurements, such as sensitivity and interference rejection. Magnetization BER versus distance for the pulsed- and pulsed-OFDM.

Fig. 3 shows a novel approach for reducing the power consumption and complexity of a multiband orthogonal frequency-division [15]. multiplexing (MB-OFDM) ultra wideband (UWB) system by applying ideas from pulsed UWB systems. The approach is quite general and applicable to many other systems. Unlike the MB-OFDM system, the enhancement that we propose uses pulses with duty cycles of less than 1 as the amplitude shaping pulse of orthogonal frequency-division multiplexing (OFDM) modulation. Pulsating OFDM symbols spread the spectrum of the modulated signals in the frequency domain, leading to a spreading gain that is equal to the inverse of the duty cycle of the pulsed sub carriers. We study the spectral characteristics of pulsed OFDM and the added degrees of diversity that it provides. The pulsed system has better performance than the pulsed-OFDM system because of better channel coding. Hence, we conclude that pulsed-OFDM systems are better in exploiting the frequency diversity of a multipath channel.

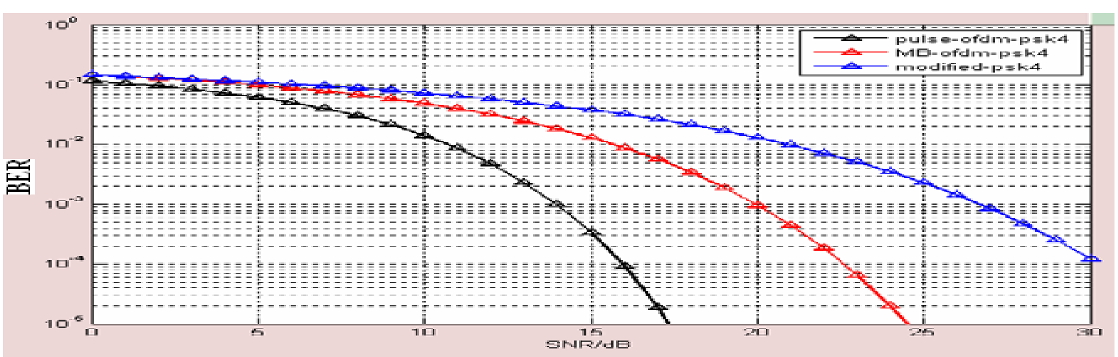

Fig. 3.

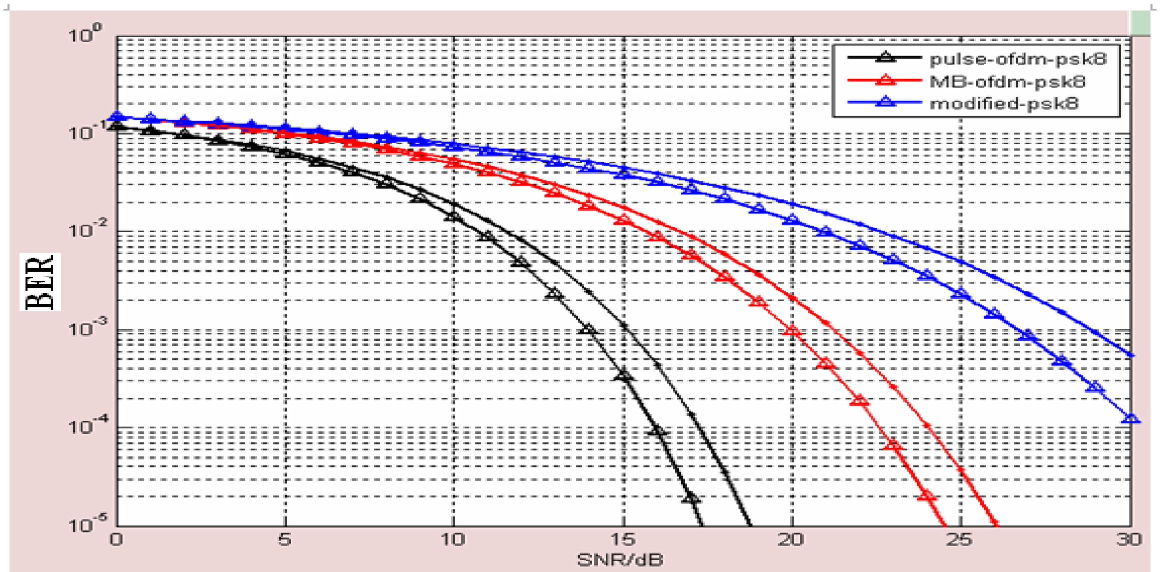

Fig. 4.

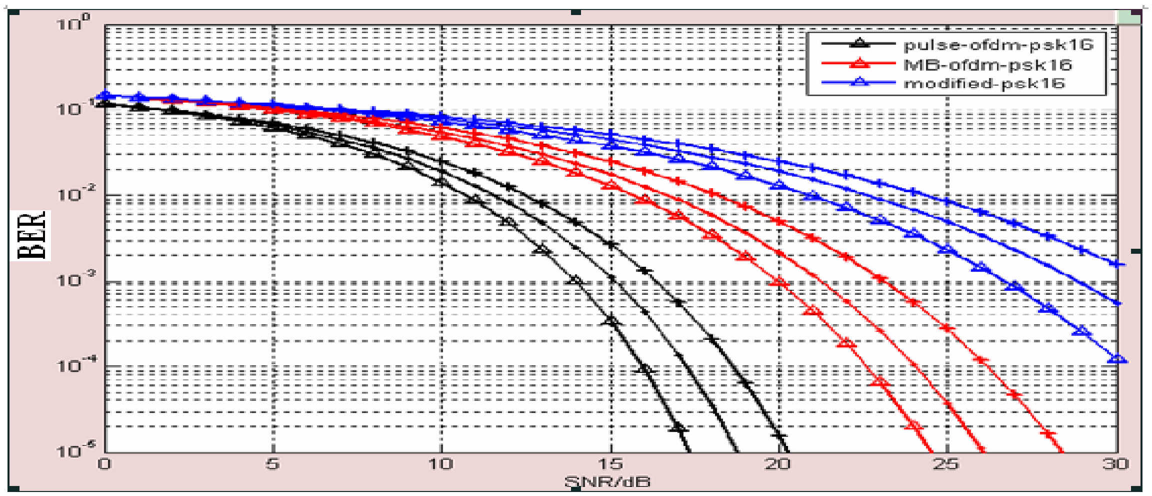

Fig. 5.

Pulsed- Fig. 5 shows describe a new orthogonal frequency division multiplexing (OFDM) scheme, named pulsed-OFDM, for ultra wideband (UWB) communications. Pulsed-OFDM modulation uses pulsed sinusoids instead of continuous sinusoids to send information in parallel over different sub-carriers. Pulsating OFDM symbols spreads the spectrum of the modulated signals in the frequency domain leading to a spreading gain equal to the inverse of the duty cycle of the pulsed sub-carriers. The spreading gain provided by this system leads to an enhanced performance in multipath fading environments. We also show that at the receiver part of the multipath diversity can be exploited by pulsed-OFDM system leading to a low complexity and low power consumption transceiver structure. [16]. Easy implementation and frequency spreading of pulsed-OFDM modulation make it a proper modulation for UWB communications where the ratio of bandwidth to the data rate is large but power spectral density is limited. We design a low complexity and low power consumption pulsed-OFDM system.

VI. CONCLUSION

The performance of MC-CDMA systems is very sensitive to the presence of co-channel interference or spatial fading correlation. Based on the theory of complex matrix vitiate distributions, we have investigated the performance of MC-CDMA systems in the presence of both co-channel interference and spatial correlation. We first have derived several exact closed-form expressions of the MC-CDMA capacity in Rayleigh fading environments, and demonstrated by experimentation the influences of co-channel interference and spatial correlation on the capacity.

Then we have tackled the outage performance issue of MC-CDMA systems with optimal transmit/receive diversity, and obtained two formulas of outage probability for general cases of Rayleigh faded signals with and without Rayleigh faded interference, respectively.

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