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MIMO – BASED STBC - OFDM SYSTEM ON TEXT MESSAGE TRANSMISSION

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***Abstract*— This paper presents a space – time block coding (STBC) orthogonal frequency-division multiplexing (OFDM) a simple paradigram for communication over fading channels using multiple transmit antennas. Space –time block codes are designed to achieve the maximum diversity order for a given number of transmit and receive antennas. The encoded OFDM system deploys digital modulation technique BPSK (binary phase shift keying) over an additive white Gaussian noise (AWGN) and other fading (Rayleigh and Rician) channel. The transmitted text message is found to have retrieved effectively under noise and fading situation. It is anticipated from the BER simulation that the performance of the communication system degrades with the increase of noise power.**

***Index Terms*— Additive white Gaussian noise (AWGN), Bit error rate (BER) , Orthogonal frequency division multiplexing (OFDM) Multiple antenna ,Space time block coding (STBC) ,**

I. INTRODUCTION

THE NEXT-generation wireless systems are required to have high voice quality as compared to current cellular mobile radio standards and provide high bit rate data services. At the same time, the remote units are supposed to be small lightweight pocket communicators. Furthermore, they are to operate reliably in different types of environments: macro, micro, and picocellular; urban, suburban, and rural; indoor and outdoor. In other words, the next generation systems are supposed to have better quality and coverage, be more power and bandwidth efficient, and be deployed in diverse environments [1]. The major problem is the required transmitter dynamic range. For the transmitter to overcome a certain level of fading, it must increase its power by that same level, which in most cases is not practical because of radiation power limitations and the size and cost of the amplifiers. The second problem is that the transmitter does not have any knowledge of the channel experienced by the receiver except in systems where the uplink (remote to base) and downlink. (base to remote) transmissions are carried over the same frequency. Hence, the channel information has to be fed back from the receiver to the transmitter [2]. The transmit diversity has been studied extensively as a method of combating determine effects in wireless fading channel because of its relative simplicity of implementation and feasibility of having multiple antenna at the base station [3]. As a result, diversity techniques have almost exclusively been applied to base stations to improve their reception quality. A base station often serves hundreds to thousands of remote units. For this reason, transmit diversity schemes are very attractive. Recently, multiple antenna techniques have been extensively studied for high rate data transmission and increasing transmission [4].The space-time block coding (STBC) technique, one of the representative multiple antenna techniques, is most attractive for these purposes. STBC, an effective transmit diversity technique, was first proposed by Alamouti [2] for flat fading channel. Alamouti suggested a space time code for two transmit antennas, which provides a diversity gain and has a very simple decoder [5]. On the other hand, the OFDM technique has been widely accepted for the transmission of high rate data due to its robustness to inter-symbol interference. In this context, the STBC-OFDM system may be one of most promising system configurations that can be adopted for 4th generation mobile systems. The combination of STBC and OFDM results in an enhanced system performance in wideband wireless channels [6],. Recently, low-density parity-check (LDPC) codes have attracted much attention particularly in the field of coding theory [7]. LDPC were proposed by Gallager in 1962 [8] and rediscovered by Mackay [9]. In order to provide channel coding gain, the family of low density parity check (LDPC) codes has emerged as an attractive alternative to turbo coding [10] showed that LDPC codes are effective to improve the error performance of OFDM in multipath environments. It has also been shown in [11] that LDPC based space-time coded OFDM systems are capable of efficiently exploiting the achievable spatial diversity in wireless channel. The concatenation of convolutional and LDPC channel coding is employed in OFDM system for achieving good error rate performance with reasonable complexity. Further to enhance system performance M.Y. Alias et al. [12] proposed concatenated LDPC and Turbo coding assisted space-time block coded wireless OFDM system. J. Wu and H-N Lee [13] have shown that channel capacity can be significantly increased by using LDPC coded modulation in multiple-input multiple-output (MIMO) multiple-access systems. Orthogonal Frequency Division Multiplexing (OFDM) is widely used in communication systems as WLAN, DVB,

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etc. It is well suited to wideband systems in frequency selective fading environments, because only a few subcarriers are impacted by a deep fade or narrow band interference, which can be protected by forward error correction. In addition, OFDM is bandwidth efficient, since a nearly square power spectrum can be created with narrow subcarriers with each subcarrier supporting a constellation with many bits per symbol. Because these subcarriers are orthogonal, they do not interfere with one another [14]. The BER performance of a concatenated LDPC encoded OFDM system is studied by M.D. Haque et al. [15] and concluded that the proposed system is very much effective in proper identification and retrieval of transmitted color image in noisy and fading environment. M. M. Hossain et al. [16] also studied the impact of LDPC on the performance of an OFDM system under various digital modulations over an AWGN and other fading channels and they shown that the proposed system with deployment of QAM modulation is highly effective to combat inherent interferences and to retrieve the transmitted black and white image properly under noisy and fading situations.

we only consider a (2x1 , 2x2 , 2x4) multiple input multiple output antenna.. The STBC-OFDM system is developed by applying Alamouti's representative STBC scheme to the OFDM system for text message transmission. We evaluate the bit error rate (BER) of the STBC-OFDM system with concatenation of outer low-density parity-check and inner convolutional channel coding schemes and compare the BER performance of the system working under each of the three types of digital modulation (BPSK, QPSK and QAM - 8) on the AWGN, Rayleigh and Rician fading channels.

II. Proposed Method

The architecture of our STBC-OFDM system for text message transmission that utilizes a concatenated LDPC scheme with multiple input multiple output antenna. At the transmitter, a text messages ' I am using text transmission with BPSK , QPSK , QAM modulation techniques." is taken as input. The Text message is converted into binary data of length 696 bits. The binary bits are encoded at the LDPC encoder. An irregular LDPC code defined by 696x1392 parity check matrix as (1392, 696) LDPC with a code rate of r = k / n generated in Matlab. The STBC – block (2x2000 size) & bytes is 64000.mod data is (48x25) & code length is bytes is 8.

These coded bits are interleaved to minimize burst error and subsequently applied to the convolutional code and modulated digitally by binary phase shift keying (BPSK)/ quadrature phase shift keying (QPSK)/ quadrature amplitude modulation (QAM) at the modulator. The outputs of the modulator are complex BPSK/QPSK/QAM modulation symbols, which are passed to the Alamouti STBC encoder where the symbol values are multiplexed to the multiple input & multiple output antenna. At the data is encode & convert to serial to parallel convert & use in ifft in data pass by insert cyclic prefix .

At the receiver, the received time domain signals after discarding the cyclic prefix are passed through an fast Fourier transform (FFT) operation to obtain the k-th subcarrier values for symbol period (2i)and (2i +1) .The signals are then fed to the Alamouti STBC decoder which apply maximum ratio combining (MRC) technique for providing strongest outputs. In MRC, signals from all paths are co phased and summed with optimal weighting to maximize combiner output signal to noise ratio (SNR). The outputs of the STBC decoder are subsequently demapped, convolutionally decoded, deinterleaved and then fed to the LDPC decoder to retrieve bits using an iterative sum-product algorithm. Finally the LDPC decoded binary bit stream is converted into text message.

III. Result Analysis

THE text message "I am using text transmission with BPSK , QPSK , QAM modulation techniques transmitted has been performed to evaluate the BER performance of the LDPC encoded STBC – OFDM system under multiple input multiple output in use different modulation scheme. Figs 1 through 3 show the BER performance of a LDPC encoded STBC – OFDM system under three types digital modulation (BPSK, OPSK, and QAM- 8) and multiple antenna (2x1 , 2x2 ,2x4) on AWGN channel.

A. *BPSK MODULATION* – this modulation technique is use of STBC OFDM in different antenna use in improve reception quality in.

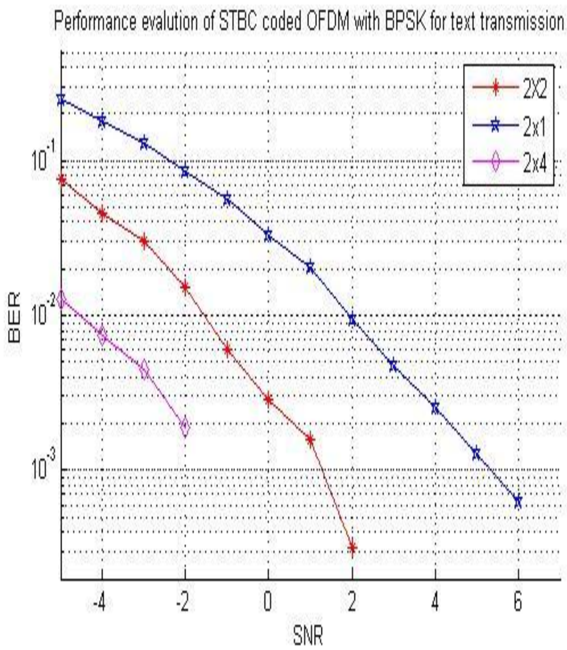

Fig 1. MIMO based STBC OFDM with BPSK

A. If (Two transmitter & One reciever)

a).(SNR = - 3 , BER = 0.0788)

I!`m$q3).g text tZAgZ]Yccikj ÷ith"BP[C ¼°A`CK"* QAM modulauiof ôách~i15es

b).(SNR = - 1 , BER = 0.0548)

I co wqing text tra.3-iss!N with0RPÓË qpSO$-!QEI modulation tmk`niques

c).(SNR = 1 , BER = 0)

I am using text transmission with BPSK , QPSK , QAM modulation techniques

B. If (Two transmitter & Two reciever)

a). (SNR = - 3 , BER = 0.0188)

I am using text trq~{okssion with BPSK ¬ qpSK , QAM modulation tgahniques

b). (SNR = - 1 , BER = 0)

I am using text transmission with BPSK , QPSK , QAM modulation techniques

C. If (Two transmitter & Four reciever)

a). (SNR = - 4 , BER = 0.0034)

I am using text trq~smission with BPSK , QPSK , QAM modulation techniques

b). (SNR = - 3 , BER = 0)

I am using text transmission with BPSK , QPSK , QAM modulation technique

B. *QPSK MODULATION* –This modulation technique SNR increase so output message is improve in bet error rate is also decrease. The show on output message in the low SNR.

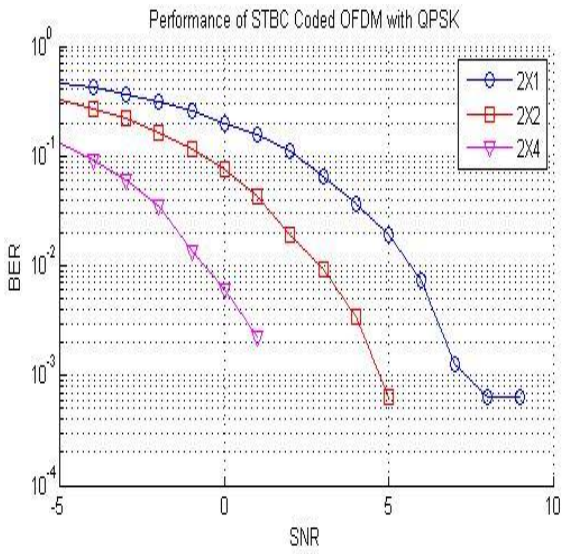

Fig.2 MIMO based STBC – OFDM with QPSK

A. If (Two transmitter & One reciever)

a). (SNR = - 3 , BER = 0.3459)

+nZ¥³¾òoþäók½2!.#ûñãäe0jhHThiJajn4knks

b). (SNR = - 1 , BER = 0.2227)

I(d`!pwéê+(pc`@!n#)ý£2°7îdÓ • TèÃtæß4® • qÐSKg}nïè\H kj$pebho(1ues

C).(SNR = 6 , BER = 0)

I am using text transmission with BPSK , QPSK , QAM modulation techniques

B. If (Two transmitter & Two reciever)

a). (SNR = - 3 , BER = 0.1438)

I a] qWI*#`4%x| ôra~kmhrsioj&qir.@ Pq)@NbTUM$, QAM mod1h%K-.`t¥#h(/2vds

b). (SNR = 3 , BER = 0)

I am using text transmission with BPSK , QPSK , QAM modulation techniques

C. If (Two transmitter & Four reciever)

a). (SNR = - 3 , BER = 0.0360)

I `m }□mb+ paxtDran{mission with FPSK , QPSK , QAM modulation$pechniqwes

b). (SNR = - 2 , BER = 0.)

I am using text transmission with BPSK , QPSK , QAM modulation techniques

D. QAM -8 MODULATION – This modulation SNR increase so BER decrease. it is the show on output message in no bit error rate & result graph.

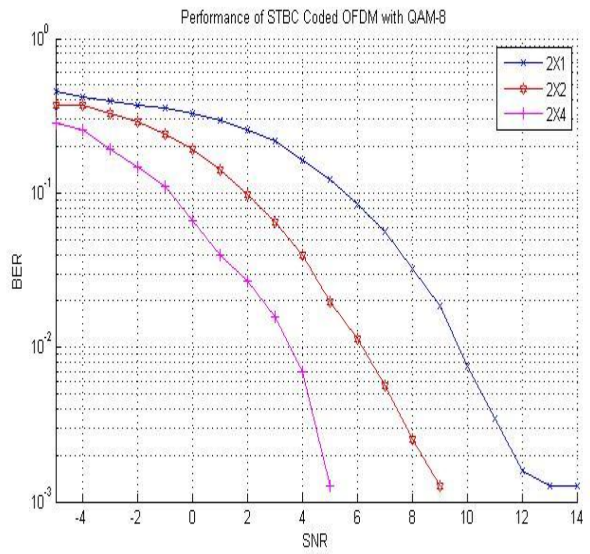

Fig.3 MIMO based STBC – OFDM with QAM – 8

A. If (Two transmitter & One reciever)

a). (SNR = 6, BER = 0.0479)

I am usi.' tmpt 42ansmission wi4(`K , QPSK ,!PIE m□tu|qdi□~0ôåcx~iques

b). (SNR = 8, BER = 0.0086)

I am using text transMIssion with BRUK , QPSK , QAM modulation techniques

c). (SNR = 9, BER = 0)
I am using text transmission with BPSK , QPSK , QAM modulation techniques

B. If (Two transmitter & TWO reciever)

a). (SNR = 6 , BER = 0.0103)

I am using te84 transmissigf with BPSK , QPSK , QAM modulatioN techniques

b). (SNR = 8 , BER = 0)
I am using text transmission with BPSK , QPSK , QAM modulation techniques

C. If (Two transmitter & Four reciever)

a). (SNR = 6 , BER = 0.0034)

I am using text tran{eission with BPSK,QPSK,QAM modulation techniques

b). (SNR = 7 , BER = 0)
I am using text transmission with BPSK , QPSK , QAM modulation techniques.

IV. CONCLUSION

In this paper, we have analyzed the bit error rate performance of a concatenated low density parity check encoded-based space-time block coded Orthogonal frequency division multiplexing system under various digital modulations employing multiple input multiple output (2x1, 2x2, 2x4) antenna. It has been showed that the proposed system achieves good error rate performance under (2x4) Antenna BPSK modulation techniques in AWGN, Rayleigh and Rician fading channels. On the basis of the results obtained in the present simulation based study, it can be concluded that the deployment of a concatenated channel coding scheme with low-density parity-check and convolutional codes and MIMO transmit diversity technique in Orthogonal frequency division multiplexing based wireless communication system under BPSK modulation is very much effective in proper identification and retrieval of transmitted text message in noisy and fading environments.

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