Adaptive STBC Encoder for Rayleigh fading reduction with noise free OFDM Communication: A review

1Ashish nadoniya, 2Prof. Papiya dutta
GGCT, Jabalpur

Abstract: **OFDM is very popular now a days because of its demand in high speed wireless data communication, it will be correct if we gave the whole credit of using 3G and 4G technology just because of OFDM. This technique is already very good and standardized, but still there are some important concerns which are still hot topics around researchers that reduction of Rayleigh fading, Reduction of BER and achieving fully orthogonal communication for more than two antennas with rate-1. Proposed work gives a new solution for reduction of Rayleigh fading and removing noise with a new adaptive STBC encoder and a adaptive RMS filter. The whole concepts is just because the signals is a thing which continuously changing and we are using same approach for type of signals. An adaptive filter and Encoder can be consider as some intelligent system which follows some algorithms and make decision**.

1-INTRODUCTION

Interference from other users and inter-symbol interference (ISI)[3] from multiple paths of one's own signal are serious forms of distortion, the latter effectively causing frequency-selective channel properties. Furthermore, when transmit and receive antennas are in relative motion, the Doppler Effect will spread the frequency spectrum of received signals. This results in time varying channel characteristics. Many systems must function without a line-of-sight (LOS)[2] path between transmit and receive antennas, thus pure Rayleigh fading may completely attenuate a signal at times and render a channel temporarily useless. Additionally, the usual additive white Gaussian noise (AWGN)[2] corrupts the signal. Besides the above difficulties, there are extremely limited bandwidth and stringent power limitations on both the mobile unit (for battery conservation) and the base station (to satisfy government safety regulations). To conserve bandwidth resources, we maximize spectral efficiency by packing as much information as possible into a given bandwidth [4]. A solution to the bandwidth and power problem is the cellular concept, in which frequency bands are allocated to small, low power cells and reused at cells far away. However, this idea alone is not enough. We must look to other means, such as space-time coding, to increase data rate, capacity, and spectral efficiency. A typical communication system consists of a transmitter, a channel, and a receiver. Space-time coding involves use of multiple transmit and receive antennas, as illustrated in Fig. 1 Bits entering the space-time encoder serially are distributed to parallel sub-streams[2]. Within each sub-stream, bits are mapped to signal waveforms, which are then emitted from the antenna corresponding to that sub-stream. The scheme used to map bits to signals is the called a space-time code. Signals transmitted simultaneously over each antenna interfere with each other as they propagate through the wireless channel. Meanwhile, the fading channel also distorts the signal waveforms. At the receiver, the distorted and superimposed waveforms detected by each receive antenna are used to estimate the original data bits.

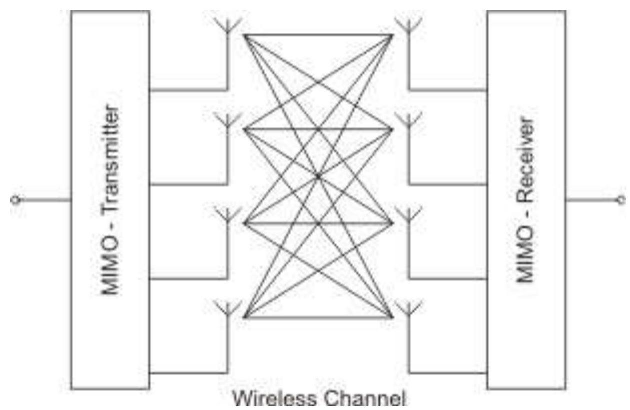

Fig 1 A typical communication system utilizing figure 1 space-time coding

2-PROPOSED STBC CODE

The pioneering work of Alamouti[5][6][7] has been a basis to create OSTBCs for more than two transmits antennas. First of all, Tarokh[7] studied the error performance associated with unitary signal matrices. Sometime later, Ganesan[7] at al. streamlined the derivations of many of the results associated with OSTBC and established an important link to the theory of the orthogonal and amicable orthogonal designs[7]. Orthogonal STBCs are an important subclass of linear STBCs that guarantee that the ML detection of different symbols $\{s_n\}$ is decoupled and at the same time the transmission scheme achieves a diversity order equal to $n_t n_r$. The main disadvantage of OSTBCs is the fact that for more than two transmits antennas and complex-valued signals, OSTBCs only exist for code rates smaller than one symbol per time slot.

According to the analysis of existing transmission matrices of quasi-orthogonal space-time block codes (STBC)[8], we generalize some of their characters and

derive several new patterns to enrich the family of quasi-orthogonal STBC. And to achieve further reduction in BER and analyses it and to achieve full transmit diversity. According to the above analysis, we know the positions of correlated values do not affect the BER. Therefore, now we derive some new matrices with different positions of correlated values from the distribution of conjugates in the bottom of transmission matrices.
Then we have design the new form as:

$$C_{P1} = \begin{bmatrix} x_1 & x_2 & x_3 & x_4 \\ x_2^* & -x_1^* & x_4^* - & x_3^* \\ X_4 & -x_3 & -x_2 & x_1 \\ X_3^* & x_4^* & -x_1^* & -x_2 \end{bmatrix}$$

The performance for the new mentioned matrices give better result when compared with TBH[6] , Jafarkhani[6], TBH correlated to Jafarkhani[3], Jafarkhani correlated to TBH[3] & the above mentioned matrices. And also on the basis of above mentioned matrix I have calculated the BER for different PSK systems.

System Model: System model consists of a input signal, M PSK[8] modulator, STBC encoder , AWGN[2] channel, STBC decoder, M PSK[8] demodulator & BER. AT the transmitter end signal is first modulated by using M PSK modulator then it is encoded using STBC[8] encoder, ,illustrated in Fig. 2 Bits entering the space-time encoder serially are distributed to parallel sub-streams. Within each sub-stream, bits are mapped to signal waveforms, which are then emitted from the antenna corresponding to that sub-stream. The scheme used to map bits to signals is the called a space-time code. Signals transmitted simultaneously over each antenna interfere with each other as they propagate through the AWGN channel. At the receiver, the distorted and superimposed waveforms detected by each receive antenna are used to estimate the original data bits.

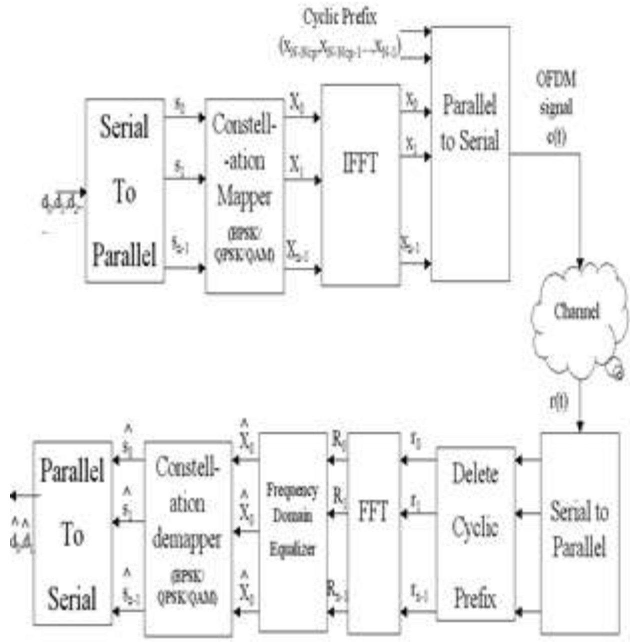

Fig 2 System Model

3-LITRRTURE SURVEY

Jitendra Kumar et. al., worked on totally various modulation techniques in that Bit Error Rate (BER) for STBC with 256-QAM is a smaller amount in order to prime SNR and BER with BPSK is a smaller amount in order to low SNR. [5] uses Space Time Trellis Coding (STTC) Whereas turnout for STBC with 256-QAM is additional as compare to STBC with BPSK at higher SNR price. Therefore STTC with BPSK is additional power economical and wish less information measure. In same year Ankit Pandit et. al. worked on BER Rendering for MPSK and MQAM in 2x2 Alamouti MIMO Systems , [4] use their procedure in order to 4-PSK only, and [4] conclude that technique used do realize an area in correcting error rates for QAM system for upper modulation schemes. model will equally be used not just in order to factors for reconciling modulation except in order to a platform to style alternative modulation systems additionally. Later on in 2014 K.V.N. Kavitha et. al. published Error Rate Analysis for STBC-OFDM System with Efficient Channel Coding Technique at low SNR" [3] discussed that when operating in a frequency selective fading environment STBC OFDM is way forward as OFDM transforms frequency fading channels into numerous flat fading sub-channels which are easier to work with. It achieves good BER but comes at a cost for increased decoding complexity and delay at receiver section. in same year Keeth Saliya et. al. published Non-coherent Amplify-and-Forward MIMO Relaying With

OSTBC Over Rayleigh–Rician Fading Channels In [2], have examine OSTBC communication over a non-coherent dual-hop MIMO relay with Rayleigh fading source–relay and Rician fading relay–destination links. By using finite-dimensional random-matrix theory, [2] have derived statistical properties for SNR at receiver. Various Rician fading scenarios are discussed in order to relay–destination link, i.e., with non-i.i.d. Rician, correlated Rician, i.i.d. Rician, and Rayleigh fading.
At last in 2013 Lennert Jacobs et. al. published Accurate BER Approximation in order to OSTBCs With Estimated CSI in Correlated Rayleigh Fading, In this contribution, [1] examined BER rendering for OSTBCs under arbitrarily correlated Rayleigh fading channels with LMMSE channel estimation. [1] presented a generalized closed-form BER approximation in order to rectangular QAM constellations, which yields very accurate BER results from low to high SNR. [1] proposed their new Encoder matrix which [1] prove less BER then all previous work.

Paper by	Outcomes
V. Tarokh, H. Jafarkhani	Achieve ¾ rate and firstly design a full orthogonal Encoder and decoder uses alamouti MIMO system and proposed concept for quasi orthogonal Encoder matrix.
Lei Liu, Hongzhi Zhang et al.	Good rendering as TBH and Jafarkhani with propose a Zero Forcing (ZF) decoding algorithm to reduce complexity for decoding
Abolade et al	Shown that quasi-orthogonal space time block codes (QOSTBCs) can achieve full diversity by rotating constellations for half transmitted symbols but work was not good when full transmitted symbols used.
Don A. S. Mindaudu	By using a genetic algorithm, rate-1 space-time block codes achieve rate-1 in order to more than 2 antennas, but it need huge computation as it uses genetic algorithm so throughput decreases significantly.
Jitendra Kumar Daksh et al	Use Space Time Trellis Coding (STTC) Whereas turnout for STBC with 256-QAM in order to rate-1 in more than two antennas, but it nessesory additional power.
Ankit Pandit et al	Use 4PSK and 4QAM in 4x4 MIMO Systems, achieve better BER then previous work but was limited in order to 4PSK only
K.V.N. Kavitha et al.	Use frequency selective fading environment STBC OFDM and achieves good BER but comes at a cost for increased decoding complexity and delay.
Keeth Saliya Jayasinghe	By using finite-dimensional random-matrix theory, derived statistical properties for SNR at receiver.
Lennert Jacobs and Marc Moeneclaey	Proposed new Encoder matrix which they prove less BER then all previous work, it was quasi orthogonal.

Table 1 : Comparative Review of different work

4-CONCLUSION & FUTURE WORK

We have plan design an adaptive space-time codes for MIMO[2] systems While reduction in decoding complexity leads to power and manufacturing cost savings, mitigating the system imperfections is necessary to prevent possible transmission errors.

A code that is only orthogonal or only has full diversity for specific constellations is still very practical. The desired data rate of a communication system is typically known, allowing a system designer to customize a full rate, full diversity code tailored to meet his specifications. However, given a specific number of groups, the maximal code rate that can be designed is still unknown. In another effort to search for high rate 2-group STBC[8], Yuen et al. can be design near future.

REFERENCES

[1] Lennert Jacobs and Marc Moeneclaey published "Accurate BER Approximation in order to OSTBCs With Estimated CSI in Correlated Rayleigh Fading" In IEEE 2013
[2] L. Keeth Saliya Jayasinghe, *Student Member, IEEE, Nandana Rajatheva, Senior Member, IEEE,* Prathapasinghe Dharmawansa, *Member, IEEE, and Matti Latva-Aho, Senior Member, IEEE published* "Noncoherent Amplify-and-Forward MIMO Relaying With OSTBC Over Rayleigh–Rician Fading Channels" in IEEE 2013
[3] K.V.N. Kavitha , Saikat Ghosh , Ankit Keetey, Sibaram Khara published "Error Rate Analysis for STBC-OFDM System with Efficient Channel Coding Technique at low SNR" in International Journal for Applied Engineering Research 2014
[4] Sajjad Ahmed Ghauri, Muhammad Sajid Javaid, Mohammad Raza Perwez, Bilal Ahmad, "Rendering for Space Time Codes in Rayleigh Fading Channel", International Conference on Information Society, 2012
[5] Subuh Pramono, Sugiharton, "Three, Four Transmit Antennas Space Time Block Coded MIMO in Rayleigh Fading Channel „Rendering Results", International Conference on System Engineering and Technology, September 11-12, 2012
[6] ZHANG jie, L1U liang, LI jin, Rendering Analysis for Space Time Block Code in MIMO-OFDM Systems, 978-1-61284-486-2/111$26.00, 2011 IEEE.
[7] Don Torrieri, Matthew C. Valenti," Efficiently Decoded Full-Rate Space-Time Block Codes". IEEE trans. On comm. system, vol.58, no.2 Feb2010.

[8] Luis Miguel Cortes- Pena, "MIMO Space-Time Block Coding (STBC): Simulation and Result, "personal & mobile communications", April 2009
[9] Lei Liu, Hongzhi Zhang, Kuanquan Wang and Wangmeng Zuo" Quasi-orthogonal Space-Time Block Codes in order to Four Antenna", 2009 IEEE.
[10] V. Tarokh, H. Jafarkhani, and A. R. Calderbank, "Space time block codes from orthogonal designs," IEEE Trans. Inform. Theory, vol. 45,pp. 1456–1467, 1999.
[11] Soumya K, Nisha S Nair and Dr. T Sudha Rendering Evaluation for Various Space Time Block Codes in MIMO Systems Over Rayleigh Channel, International Conference on Control Communication and Computing (ICCC),2013
[12]Jia Hou, Moon Ho Lee, Senior Member, IEEE, and Ju Yong Park, "Matrices Analysis for Quasi-Orthogonal Space-Time Block Codes". IEEE Communications Letters, VOL. 7, NO. 8, AUGUST 2003.
[13]Claude Oestges and Bruno Clerckx," MIMO Wireless Communication from real world propagation to space-time code design.2007.
[14]V. Tarokh, H. Jafarkhani, and A. R. Calderbank, "Space time block codes from orthogonal designs," IEEE Trans. Inform. Theory, vol. 45,pp. 1456–1467, 1999.
[15]H. Jafarkhani, "A quasi orthogonal space time block codes," IEEE Trans. Commun., vol. 49, pp. 1–4, 2001.
[16]S. M. Alamouti, "A simple transmit diversity technique in order to wireless communications," IEEE J. Selected Areas in Communication, vol. 16, pp.1451–1458, 1998.

