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Modelling & Performing Analysis of an Alamouti Transmit Diversity System by using JTRAS Scheme & with Gold Code in different regions using MIMO System

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Abstract: we consider a sub-optimum joint transmit receive antenna selection (JTRAS) scheme in multiple input multiple output(MIMO) systems equipped with N transmit and three receive antennas.At the transmitter,we keep one antenna as fixed and select the best among the remaining N-1 Antenna.After selecting two transmit antennas,we select the receive antenna for which the signal to noise ratio (SNR) is maximum.we assume spatially independent flat fading channels with perfect channel state information(CSI) at receiver and an ideal feedback link.we use Alamouti transmit diversity and derive the exact closed-form expression for the pdf of received SNR, using which we obtain bit error rate (BER) for BPSK constellation. We have presented simulation results and compared them with the derived analytical expressions. We have discussed some special cases of the considered antenna performance of the considered scheme with the other available schemes in terms of number of feedback bits and BER. We conclude that the considered JTRAS scheme reduces number of feedback bits compare with the golden code.

***Keywords*—Alamouti transmit diversity (ATD), bit error rate (BER), Rayleigh fading channel, joint transmit receive antenna selection (JTRAS).**

I.Introduction:

Multiple input multiple output (MIMO) systems with space time coding are used in wireless communications to reduce the effect of fading by providing diversity gain. However, there are some bottlenecks of MIMO systems such as limited spacing between adjacent antennas at mobile station, power spreading between transmit antennas and the requirement of costly RF chains for every active transmit/receive antenna pair. One of the approaches to alleviate these problems,without loss of diversity gain, is selection of antenna or subset of antennas at the transmitter or at the receiver or at both the ends.

In practice for the case of Frequency Division Duplex (FDD), based on the available channel state information(CSI), receiver selects transmit antennas and send the index of the antenna to the transmitter via a dedicated feedback channel. However, execution of antenna selection(AS) algorithm at the receiver and requirement of ideal feedback channel increase complexity and overheads.Therefore, sub-optimum AS with less complexity and feedback channel with low data rate are of interest.

we have considered a sub-optimum JTRAS scheme in a (N, 2; 3,1) system. In the first step,for each receive antenna, we keep one transmit

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antenna fixed and select the best among the remaining $N-1$ antennas.In the second step, we select the receive antenna for which the signal to noise ratio (SNR) is maximum.Then, we have considered Alamouti transmit diversity (ATD) and derived the exact closed form expression for the pdf of received SNR. Finally, we have obtained expression of BER for BPSK constellation.

II.MIMO Systems:

MIMO(multiple input, multiple output) is an antenna technology for wireless communicatios in which multiple antennas are used at both the source(transmitter) and the destination(rexceiver).the antennas at each end of communications circuit are combined to minimize errors and optimize data speed.

MIMO systems with space time coding are used in wireless communications to reduce the effect of fading by providing diversity gain.

A MIMO system with anteena selecxtion has been shown to significxantly out perform a system exploiting the same no. of RF chains without antenna selection.To deal with such challenges,a promising techniques reffering to antenna subset of available antenna,which can effectively reduce no.of RF chain required,yet preserving selection diversity gains.

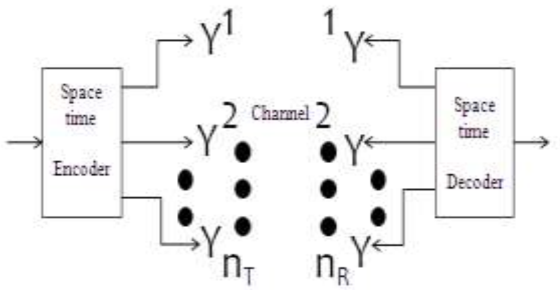

Fig:1:MIMO systems

Why MIMO?

• Higher data rates, improved reliability and coverage
• Very expensive spectrum licenses (increasing the operating bandwidth may not be a good idea!)
• Broadband over air
• Multimedia applications (video streaming, e-commerce...)
• Wireless internet access (WLAN, WiFi, WiMax)
• Wireless last-mile systems (home, office)
• Vehicular networks (vehicle-to-vehicle, vehicle-to-infrastructure)
• Short-range applications (indoor WiFi)
• Optical wireless communications
• Underwater communications (e.g. sonar)
• Radar applications (Enhanced beam forming performance)

III. Alamouti Transmit Diversity:

This technique is a simple transmit diversity scheme which improves the signal quality at the receiver on one side of the link by simple processing across two antennas on the opposite side

ATD scheme depends upon Space Time Block Coding.

- A space–time code (STC) is a method employed to improve the reliability of datatransmission in wireless communication systems using multiple transmit antennas.
- STCs rely on transmitting multiple, surplus copies of a data stream to the receiver in the hope that atleast some of them may survive the physical path between transmission and reception in a good enough state to allow reliable decoding.

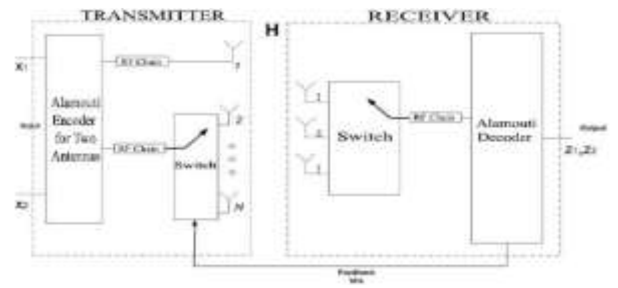

Fig:2: Block Diagram Of An Alamouti Transmit Diversity System With Sub-optimum *(N, 2; 3, 1) JTRAS scheme.*

IV. BPSK Modulation Scheme:

- BPSK is the simplest form of phase shif keying(PSK). In BPSK,individual data bits are used to control the phase of the carrier.
- During each bit interval,the modulator shifts the carrier to one of two possible

phases,which are 180 degrees and 0 degrees.

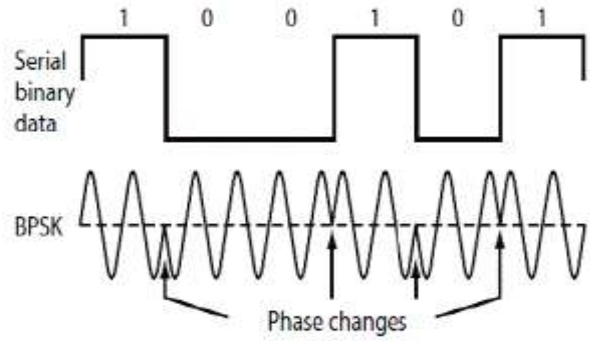

Fig:3:BPSK modulation

V.Golden code:

Golden Code is a 2×2 algebraic perfect space-time code with unprecedented performance based on the Golden number (1+√5)/2. It is a full-rate, full-diversity Space-Time code for 2 transmit and 2 receive antennas, for the coherent MIMO channel. In this page, we discuss Golden code for 2transmitters-1receiver system(2x1) and 2transmitters-2receivers system(2x2).

Properties:

1. **Full-rank** : The determinant of the difference of 2 codewords is always different from 0.
2. **Full-rate** : The four degrees of freedom of the system are used, which allows to send 4 information symbols.
3. **Non-vanishing determinant**: The minimum determinant of the Golden Code is 1/5.
4. **Cubic shaping** : each layer is carved from a rotated version of Z[i]^2.
5. The spectral efficiency is 2log2(M) bits/s/Hz.

V. Results:

Golden Code:

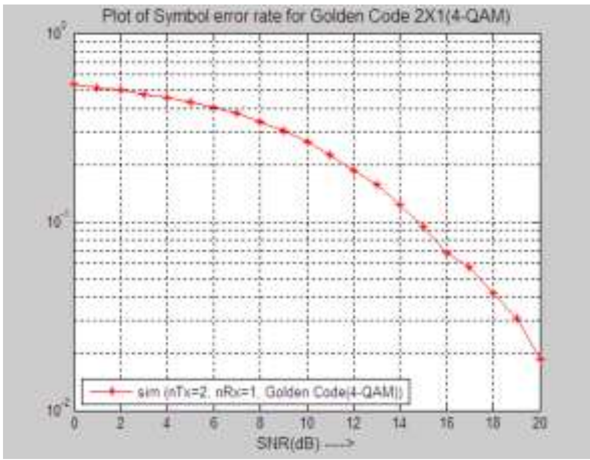

Fig: plot of symbol error rate for golden code 2x1(4-QAM)

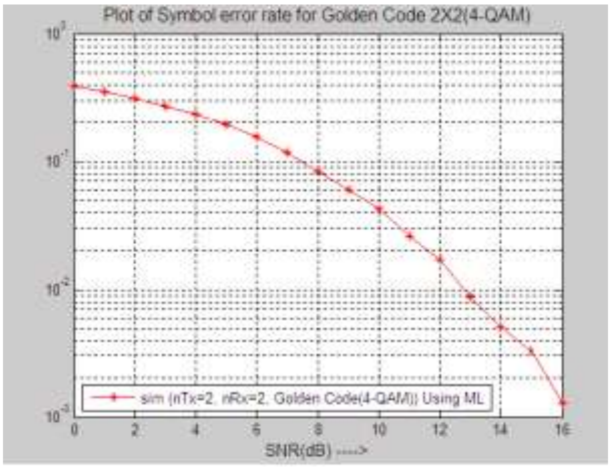

Fig: plot of symbol error rate for golden code 2x2(4-QAM)

Alamouti JTRAS scheme:

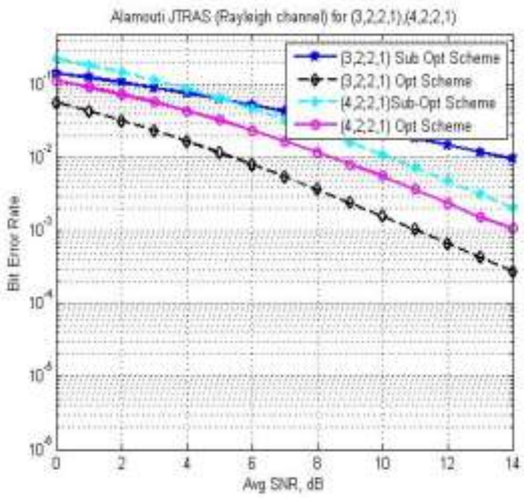

Fig:Alamouti JTRAS(Rayleigh channel)for (3,2;2,1),(4,2;2,1) for optimum &sub-optimum

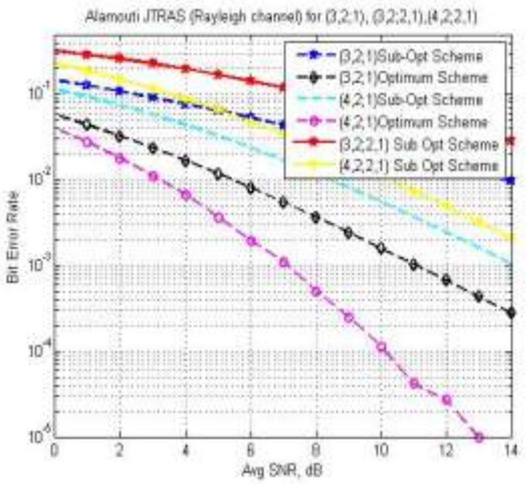

Fig:Alamouti JTRAS(Rayleigh channel)for (3,2;1),(3,2;2,1),(4,2;2,1) for optimum &sub-optimum

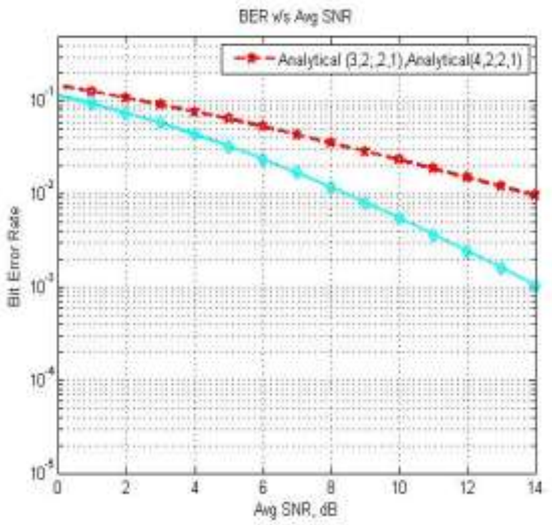

Fig:Alamouti JTRAS(Rayleigh channel)for (3,2;2,1),(4,2;2,1) for optimum &sub-optimum

v. Conclusion:

We have considered a joint transmit and receive antenna selection (JTRAS) scheme in a special case of MIMO systems, equipped with N transmit antennas and three receive antennas. At the transmitter, we keep one antenna as fixed and select the best among the remaining $N - 1$ antennas. At the receiver, we select the best antenna out of three antennas. The Alamouti space time block coding is a simple MIMO technique that can be used to reduce the BER of a system, at a specific SNR, without any loss on the data rate. Golden code technique is also used to calculate the Bit error rate in the Space block transmitter but Comparing with the results, Alamouti JTRAS scheme decreases more no. of feedback bits than the Golden code.

We conclude that the considered JTRAS scheme requires less number of feedback bits.

N	3	4	5	6	9	10
(N,2;1)Opt	4	4	6	6	8	8
(N,2;1)Sub-Opt	1	2	2	3	3	4
(N,2;2,1)Opt	4	4	6	6	8	8
(N,2;2,1)Sub-Opt	1	2	2	3	3	4
(N,2;3,1)Opt	4	4	6	6	8	8
(N,2;3,1)Sub-Opt	1	2	2	3	3	4
Number Of Feedback Bits Requirement						

VI.Future scope:

The Project simulation is done under different channels in optimum and sub-optimum regions and compared the BER, SNR with the Golden code in that regions with different transmitters and soon we would enhance our project by comparing our transmitter with Silver code and MIMO Blast model

VII.References:

[1] V. Tarokh, N. Seshadri and A. R. Calderbank, “Space-time codes for high data rate wireless communication: performance criterion and code construction,” *IEEE Trans. on information theory*, vol 44, No. 2, pp. 744-765, March 1998.

[2] S. M. Alamouti, “A simple transmit diversity technique for wireless communications,” *IEEE J. Selected Areas Communications*,vol. 16, pp. 1451-1458, October 1998.

[3] V. Tarokh, H. Jafarkhani and A. R. Calderbank, “Space-time block codes from orthogonal designs” *IEEE Trans. Inform. Theory*, vol 45, pp. 1456-1467, July 1999.

[4] J. M. Chakravarti, Y. N Trivedi, “Performance Analysis of Alamouti Transmit Diversity with Transmit Antenna Selection for Reduced Feedback Rate,” *ICDeCom-11, BIT Mesra (Ranchi),India*, February 2011.

[5] Z. Chen, J. Yuan, B. Vucetic and Z. Zhou, "Performance of Alamouti scheme with transmit antenna selection," *Electronics Letters*, vol. 39, No. 23, pp. 1666-1668, November 2003.
[6] Y. Wang, G. Shen, H. Yu, S. Liu, J. W. Chong, "Exact BER expression for Alamouti scheme with joint transmit and receive antenna selection," *Proc. WiCom*, pp. 13281331, Sep. 2007.
[7] J. G. Proakis, digital communication 4 ed, MH 2001.