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MASSIVE MIMO COMMUNICATION SYSTEM

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ABSTRACT: -

The quickly developing interest for their mote transmission video , discourse and data is driving the communication innovation to be more productive and more solid. MIMO has turned out to bone of the key advances for remote communication frameworks. One of the promising transmit diversity plan is Altamonte space time block codes (A-STBC). In this project, ways to deal with enhancing the data rate over the multiple radio wire channels for dependable communication has been implemented . Dissimilar To, the vast majority of the strategy exists to accomplish fullassorted qualities and full rate, we expect to build the data rate over the channel by utilizing mark channel display. Furthermore, we studied Alamouti STBC-MIMO system performance under different modulation schemes such as QPSK, QAM and BPSK. It is clearly observed by the simulation result that the system performance enhances usingBPSK.

I. INTRODUCTION:

Due to the explosion of demand for high speed wireless services, such as wireless internet, e-mail, cellular video applications ,wireless communication has become one of the most exciting fields in modern engineering. However, development of such services faces significant challenges to support the high data rates and capacity required for these applications with these verely restricted resources in wire less communication channel. The obstacles associated with wire less environments are difficult to over come. Interference from other users and inter symbol interference(ISI) from multipath of one' sown signal are serious forms of distortion.Furthermore, when transmit and receive antennas are in relative motion, the Doppler effect will spread the frequency spectrum of received signals and also there are extremely limited band widths. To conserve bandwidth resources, we maximize spectral efficiency by packing as much information as possible into a given bandwidth. 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

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far away. However, this idea done is not enough. The solution to this problem is multiple antennas both for transmission and reception in wireless communication systems,popularly known as MIMO technology. An effective and practical way to approach these demands of MIMOwireless channel is to employ Space Time (ST) Coding. It is a coding technique designed for use with multiple transmit antennas,to increase data rate, capacity and spectral efficiency.

MIMO systems use multiple transmit and receive antenna stocreate multiple spatial channels between the transmitter and the receiver, which forms the basis to increase the data rate without increasing the bandwidth. If perfect channel state information (CSI) is available at thereceiver, the average capacity grows linearly with smaller of the numbers of transmit and receiveantennas under certain channel conditions. The major potential advantage of MIMO is that either the quality in terms of bit error rate (BER) or the data rate of the system can be improved. The Performance improvement of MIMO systems can be assessed by using diversity gain and spatial multiplexing gain. It is not possible to achieve maximum diversity and multiplexing simultaneously because there is a trade-off between them .Diversity gain is achieved by transmitting the same signal over multiple independent fading environments ,e.g. ,intime ,frequency and spatial domains. Space Time Coding transmits signals across the spatial and time domain simultaneously in order to achieve diversity gain without increasing bandwidth. High data rate can be achieved by using multiple transmit and receiveantennas. However, employing multiple receive antennas at the mobile units seems less practicaldue to the size and power limitations. Thus, transmit diversity technique becomes a promising approach to achieve diversity for the downlink (from base-stations to mobiles) transmissions. Since, the first full- rate full- diversity orthogonal code proposed by Alamouti for systems with two transmit antennas,there has been extensive work on a variety of space -time transmission schemes.Space time block codes (STBCs) have been proposed to realize the enhanced reliability of multi-antenna systems.When the transmitter has two antennas, Alamouti codes achieve the full-diversity performance with a symbol rate of 1 (rate-one). There is no channel state information at the transmitter (CSIT) but perfect channel state information at the receiver(CSIR).In this paper, an approach

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to improve the data rate over the multiple antenna channels for reliable communication. Unlike,most of the technique exists to achieve full diversity and full rate,we aim to increase the data rate over the channel by using dent channel model. We exploit the time and space diversity simultaneously to improve the performance of the system under mobile radio channel.Furthermore, simulations and analysis results are carried out using dent's channel model in terms of BER and the coding methods are suggested for 2x2 Alamouti STBC MIMO systems. Simulation results are carried out with a very simple decoding technique i.e.ML decoding at the receiver. Although the technique of two transmit antennas is the main focus of this paper,the same idea can be directly applied to Alamouti STBC codes with more than two transmit antennas.

II.LITERATURE SURVEY:

Figure shows, a typical Alamouti STBC-MIMO communication system consists of transmitter,channel and receiver. Space Time coding involves use of multiple transmit and receive antennas. Figure1 shows the transceiver of MIMO in space time code. Bits entering the information source system are mapped into the symbol mapper (modulation) using different modulation techniques like BPSK, QPSK and 16-QAM. Bits entering the Alamouti space time block encoder serially are distributed to parallel sub streams. Within each substream,bits are mapped to signal waveforms,which are then emitted from the antenna corresponding to that sub stream. Signals transmitted simultaneously over each antenna interfere with each other as they propagate through the wireless channel.The receiver collects the signal at the output of receiver antenna element and reverses the transmitter operation inorder to decode the data withAlamouti space time block decoder.

ALAMOUTI 2X2

Weassumethatthechannelparametersremai nconstantduringthetwotimeslots.Encodingi sdonein thesame manneras discussed in Alamouti 2X1 code.

	Transmitter 1	Transmitter 2
Time t	x_1	x_2
Time t + T	$-x_2^*$	x_1^*

MLDecoding

The best performance is given by the brute force ML decoder which searches for the matrix X Which Minimizes the overall noise power.i.e.,

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DENT CHANNEL MODEL

A Rayleigh fading channel constitute Doppler's spectrum is produced by

III.PROPOSED METHODOLOGY:

Orthogonal Frequency Division Multiplexing System:

OFDM is a special form of Multi Carrier Modulation (MCM) with densely spaced sub carriers with overlapping spectra, thus allowing for multiple-access. MCM is the principle of transmitting data by dividing the stream into several bit streams, each of which has a much lower bit rate, and by using these sub-streams to modulate several carriers. This technique is being investigated as the next generation transmission scheme for mobile wireless communications networks.

In geometry, orthogonal means, "involving right angles' ' (from Greek ortho, meaning right, n gon meaning angle). The term has been extended to general use, meaning the characteristic of being independent (relative to something else). It also can mean non - redundant, non-overlapping, or irrelevant. Orthogonality is defined for both real and complex valued functions [2]. The functions $_m(t)$and $*_m(t)$ are said to be orthogonal with respect to each other over the interval a

$$E\{T(t)T^*(t)\} = 1, N_s = N/4, i = \sqrt{(-1)}, \beta_n = \prod{}^* n / N_0$$

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As aforementioned ,OFD Misaspecial form of MCM and the OFDM time domain waveforms are chosen such that mutual Orthogonality is ensured even though sub-carrier spectra may overlap.With respect to OFDM, it can be stated that Orthogonality is an implication of a definite and fixed relationship between all carriers the collection. It means that each carrier is positioned such that it occurs at the zero energy frequency point of all other carriers. The sinc function, illustrated inFigure3.1exhibits this property and it is used as a carrier in OFDM system[3].

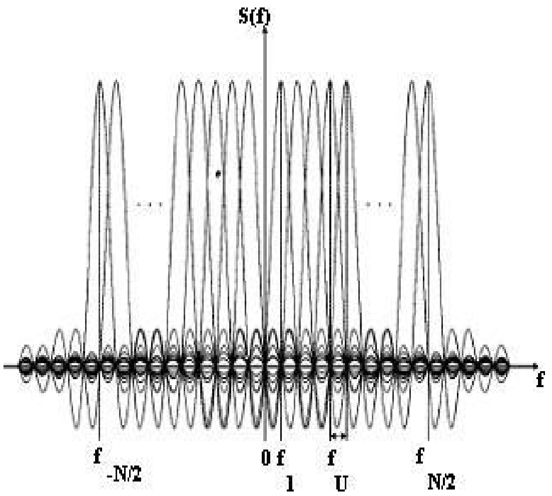

Figure1OFDMsubcarriersinthefrequencydomain

OFDMsystemGeneration

To generate OFDM successfully the relationship between all the carriers must be carefully controlled to maintain the Orthogonality of the carriers.For this reason ,OFDM is generated by firstly choosing the spectrum required ,based donde input data,and modulation scheme used. Eachcarrier to be produced is assigned some data to transmit. The required amplitude and phase of the carrier is then calculated based on the modulation scheme(typically differential BPSK, QPSK, orQAM).

The required spectrum is then converted back to its time domain signal using an InverseFourier Transform. In most applications, an Inverse Fast Fourier Transform (IFFT) is used. TheIFFT performs the transformation very efficiently, and provides a simple way of ensuring the carrier signals produced are orthogonal. The Fast Fourier Transform (FFT) transforms a cyclic time domain signal into its equivalent frequency spectrum. This is done by finding the equivalent waveform, generated by a sum of orthogonal sinusoidal components. The amplitude and phase of the sinusoidal components represent the frequency spectrum of the time domain signal[2].

The IFFT performs the reverse process, transforming a spectrum (amplitude and phase of each component) into a time domain signal. An IFFT converts a number of complex data points,of length,whichisapowerof2,into the time domain signal of the same number of points.Each data point in frequency spectrum used for an FFT or IFFT is called a bin. The orthogonal carriers required for the OFDM signal can be easily generated by setting the amplitude and phase

of each bin, then performing the IFFT. Since each bin of an IFFT corresponds to the amplitude and phase of a set of orthogonal sinusoids, the reverse process guarantees that the carriers generated are orthogonal.

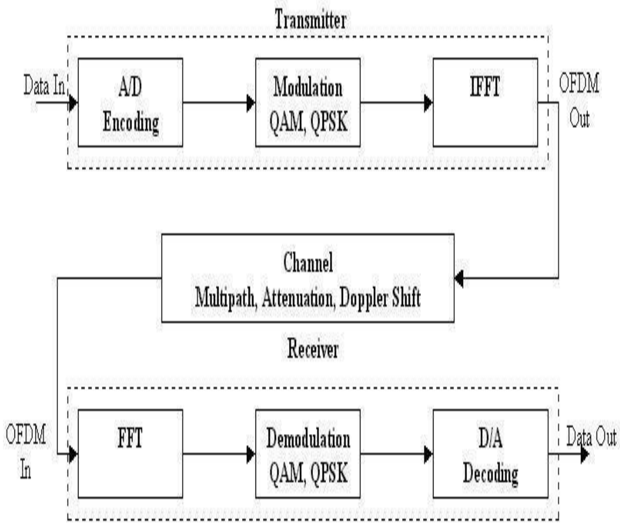

Figure2BlockdiagramofOFDM

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SIMULATION RESULT:

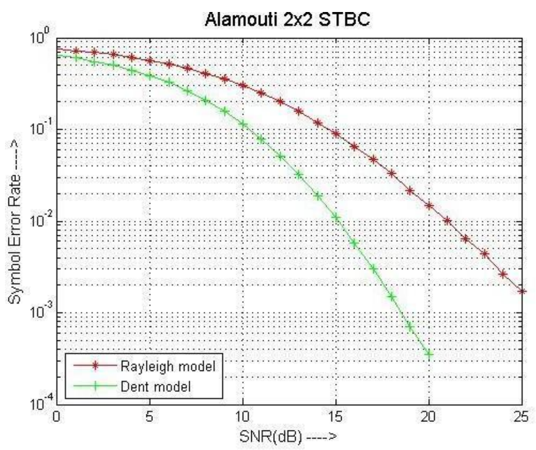
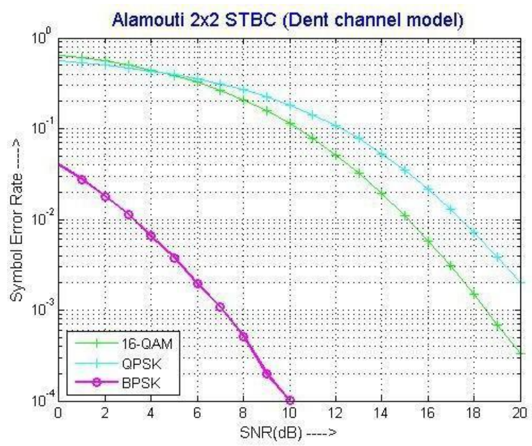


Fig:3 Alamouti 2*2ST BC

Through the use of spatial multiplexing, multi-input, multi-output (MIMO) antenna technologiesallowthetransmissionofmultipleparalleldatastreamsoverthesametime-frequencyresources.Multi-user MIMO (MU-MIMO) offers the benefits of MIMO to multiple users, and is of particular interest to cellular systems and wireless local-area networks . While MU-MIMO deployments to date have involved a small number of base station antennas (for instance, LTE-Advanced, as standardized by 3GPP Release 10, uses 8 antenna ports per cell sector), recent research has shown that it may be possible and indeed desirable to deploy a very large number of antennas at the base station.Such technologies are called *massive MIMO*, and are characterized by having many more antennas at the base station than active mobiles within the cell.Although It can be applied to frequency-division duplexing (FDD) based systems, most massive MIMOsystems use time-division duplexing (TDD), where, thanks to channel reciprocity, the number of pilots needed for channel estimation scales in the number of users rather than in the number of base station antennas.Typical design targets for massive MIMO area few hundred antenna satta base station serving dozens of mobiles.Having so many antennas allows energy to be sharply focused into



a particular point in space,

Fig:4 Alamouti 2*2ST BC(dntchannelmode)

providing a dramatic improvement in energy efficiency,while the excess of antennas provides additional degrees offered om that provide opportunities for interference suppression and the use of reduced complexity hardware.

IV. CONCLUSION:

In this paper , we studied Alamouti STBC-MIMO system performance under different mobile radio channels (dent channel model & Rayleigh channel model). System performance is compared with three different modulation techniques and systems with BPSK modulation gives better results. Furthermore, Alamouti STBC provides a coderate of 1 and provide full rate and full diversity system with simple decoding technique. Maximum likelihood (ML) decoding reduces the decoding complexity of the system and enhances the system performance. By employing dent models at the channel, simulation speed is increased as compared to the Rayleigh channel model. This increases the data speed. It is clearly observed by

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the simulation result that the system performance enhances usingdent channel model.

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