IJESRT
INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

COMPRESSION AND PERFORMANCE OF DETECTION SCHEME BY VARYING MODULATION BITS AND SIZE OF MIMO SYSTEM

Mr. Nitish Sharma
Research Scholar
Suresh Gyan Vihar University

Mr. Ashish Jangid
C.E.O. & Founder
Venture Era, Jaipur

Mrs. Sandhya Sharma
H.O.D. (E.C.E.)
Suresh Gyan Vihar University

ABSTRACT

MIMO Plays an momentous Role in fourth generation Wireless technology. This technology is being perpetually used in designing of a no. of rapidly frowning Cost effective and reliable systems. As MIMO stand for MULTIPLE INPUT & MULTIPLE OUTPUT, so no of input (No. of Rx.) and No: of output (No. of tx.) also plays a vital role in designing of efficient system. In this Paper we will mostly work with effect of No. of Transmitters and Receivers on selection of detection schemes.

KEYWORDS: MIMO, Transmission Channels, QAM-8bit, QAM-16bit, QAM-32bit

INTRODUCTION

MIMO has opened the doors for designer of new applications and development of expiatory applications in more cost effective and efficient way. This paper provide a study of variation in no. of Transmitter and Receiver and Their effect on selection of modulation technique and detection schemes The study is to a be done by using a windows stand alone application which Sometimes agree with concepts of Signal processing and sometimes don't. In this research paper a simulation is been carried out for selection of detection scheme and results are measured on The Basic of BER.

MATERIALS AND METHODS

MIMO : -

MIMO technology has been standardized for wireless LAN,3G Mobile phone networks and 4G Mobile phone networks and is in wide spread Commercial use . MIMO is method for multiplying the Capacity of a receiver Link using multiple transmit and receive antennas to exploit multipath propagation. MIMO is an element of wireless Communication. The term MIMO referred to the mainly theoretical use of Multiple antennas at both the transmitter and receiver. In modern usage,' MIMO' Specifically refer to a practical technique for sander and receiving Then one data signal on The some radio channel at the same time via multipath propagation.

MIMO Can be sub decide in 3 Main categories

Precoding – It's is multi stream beam forming. in more general terms, it is a spatial processing that occurs at the transmitter. In single-stream beam forming, the same signal is transmitted from each of the transmit antennas with appropriate phase and gain weighting such that the signal power is maximized at the receiver input. The benefits of beam forming are to increase the received signal gain - by making signals emitted from different antennas add up constructively - and to reduce the multipath fading effect. When the receiver has multiple antennas, the transmit beam forming cannot simultaneously maximize the signal level at all of the receive antennas.

Spatial multiplexing- In spatial multiplexing, a high-rate signal is split into multiple lower-rate streams and each stream is Transmitted from a different transmit antenna in the same frequency channel. If these signals arrive at the receiver antenna with sufficiently different spatial signatures and the receiver has accurate, it can separate these streams into parallel channels. Spatial multiplexing is a very powerful technique for increasing channel capacity at higher signal-to-noise ratios (SNR). Spatial multiplexing can also be used for simultaneous transmission to multiple receivers, known as space-division multiple access or multi-user MIMO.

Diversity coding- In diversity methods, a single stream (unlike multiple streams in spatial multiplexing) is transmitted, but the signal is coded using techniques called space-time coding. The signal is emitted from each of the transmit antennas coding. Diversity coding exploits the independent fading in the multiple antenna links to enhance

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

signal diversity. Because there is no channel knowledge. Diversity coding can be combined with spatial multiplexing when some channel knowledge is available at the transmitter.
Modulation- It is the process by which a carrier signal superimposed on the modulating signal, in modulation modulating signal has some information. In digital modulation, an analog carrier signal is modulated by a discrete signal. Digital modulation methods can be considered as D-to-A conversion, and the corresponding demodulation or detection as analog-to-digital conversion.

Digital Modulation Method-
The most fundamental digital modulation techniques are based on keying:

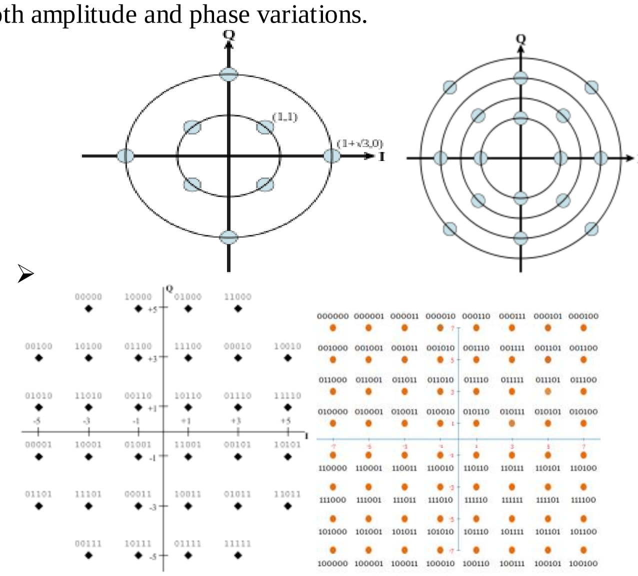
1.PSK (phase-shift keying): a finite number of phases are used.
2.FSK (frequency-shift keying): a finite number of frequencies are used.
3.ASK (amplitude-shift keying): a finite number of amplitudes are used.
4.QAM (quadrature amplitude modulation): a finite number of at least two phases and at least two amplitudes are used.

1. PSK (phase shift keying)-is a digital modulation scheme that conveys data by changing, or modulating, the phase of a reference signal which is the carrier wave.

 # BPSK (Binary phase shift keying)- is the simplest form of phase shift keying (PSK). It uses two phases which are separated by 180° and it is also called 2-PSK. This modulation is the most robust of all the PSKs since it takes the highest level of noise or distortion

 # QPSK(Quadrature phase shift keying)- Sometimes this is known 4-QAM. Although the concepts of QPSK and QAM are different, the resulting modulated waves are exactly the same.

2.QAM (Quadrature amplitude modulation)- Quadature amplitude modulation (QAM) is a modulation scheme in which two sinusoidal carriers, one exactly 90 degrees out of phase with respect to the other, are used to transmit data over a channel. Because the orthogonal carriers occupy the same frequency band and differ by a 90 degree phase shift, each can be modulated independently, transmitted over the same frequency band, and separated by demodulation at the receiver. For a given available bandwidth, QAM enables data transmission at twice the rate of standard pulse amplitude modulation (PAM) without any degradation in the bit error rate (BER). QAM and its derivatives are used in both mobile radio and satellite communication systems. QAM is a signal in which the resultant output consists of both amplitude and phase variations.



Detection Schemes-
ZF(Zero Forcing)- Zero Forcing detection scheme is linear in nature but it suffers from sudden noise enhancement. It gives optimum results at some value of SNR.
ZF-SIC(Zero forcing-successive interference cancellation - An equalizer, called group successive interference cancellation zero-forcing equalizer (GSIC-ZFE), for space-time modulated codes (STMC) is proposed. Base on the structure of STMC, the proposed equalizer provides ISI-free communications over the ISI MIMO channels without a long guard period. The GSIC-ZFE is based on linear FIR zero-forcing equalizer (FIR-ZFE) and the successive

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

interference cancellation (SIC). In each iteration, a group of elements in the source signal vector are detected and canceled. The performance of FIR-ZFE designed in each iteration can therefore be enhanced. At the same time, the error propagation problem associated with SIC is reduced by limiting the cancellation process to be independent in each time slot. We further considered the SIC operated in a group-by-group basis to reduce the computational complexity of the GSIC-ZFE. Simulation results presented in the paper has shown substantial gain can be obtained by GSIC-ZFE.

ML(Maximum likely hood)-Maximum Detection (ML) symbol detection method is one of the optimum methods of detecting the transmitted symbols at the receiving part, which are being transmitted from the transmitting part. This detection scheme is non linear in nature.

QR Decomposition- The QR Decomposition is an effective technique of solving matrix inversion problem. Hence, for a given matrix , we can find out its QR Decomposition as:-

$$A=QR$$

Where R is the upper triangular matrix and Q is the orthogonal matrix

Minimum Mean Square Error(MMSE)- The MMSE detector holds back both interference as well as noise components, but in comparison with ZF detector, it only removes the interference or the noise. From this we can come to a conclusion that the mean square error (MSE) is minimized. To overcome the drawback of sudden noise enhancement of ZF, the concept of MMSE is introduced for detection. So, we can say that, MMSE is pretentious to ZF in the presence of noise and interference.

Minimum Mean Square Error*-successive interference cancellation*(MMSE-SIC)- The effects of uniform spreading in OFDM-CDMA systems is the harmonization at the reception of the signal to noise ratio between the sub-bands which prevents the good performance of successive decoding algorithms.

Successive interference cancellation (SIC)

it is a physical layer capability that allows a receiver to decode packets that arrive simultaneously. y, SIC is the ability of a receiver to receive two or more signals concurrently.SIC is possible because the receiver may be able to decode the stronger signal, subtract it from the combined signal, and extract the weaker one from the residue.

SIMULATION RESULTS

In this section, we have illustrated the 16-QAM, 32-QAM, 64- QAM schemes for different detection techniques at various set of channels. The simulations are done for a Rician fading channel. Here, the simulation is done on MATLAB 2013a deployed application on core i3 processor as per the standards of IEEE802.11a. Table shows the BER performance comparison for a MIMO system with varying transmitting and receiving antenna i.e. Tx=2,4,6 and Rx=2,4,6 for ZF, MMSE, QR, MMSE-SIC, ZF-SIC and ML detection scheme for Rician channel. From the outputs shown, it can be concluded that the value of BER for which detection scheme is low compared to the other detection techniques.

16 Bit QAM:

Sr.	Tx.	Rx.	Time	Best Technique
1	2	2	115	ML
2	4	2	115	MMSE-SIC
3	6	2	86	ZF
4	2	4	112	ML
5	4	4	113	MMSE-SIC
6	6	4	86	MMSE-SIC
7	2	6	113	ML
8	4	6	93	MMSE-SIC
9	6	6	97	MMSE-SIC

32 Bit QAM:

Sr.	Tx.	Rx.	Time	Best Technique
1	2	2	94	ML
2	4	2	85	MMSE-SIC
3	6	2	77	MMSE
4	2	4	95	ML
5	4	4	76	MMSE-SIC
6	6	4	77	MMSE-SIC
7	2	6	95	ML
8	4	6	79	MMSE-SIC
9	6	6	76	MMSE-SIC

64 Bit QAM:

Sr.	Tx.	Rx.	Time	Best Technique
1	2	2	79	ML
2	4	2	70	MMSE-SIC
3	6	2		*
4	2	4	82	ML
5	4	4	66	MMSE-SIC
6	6	4	89	MMSE-SIC
7	2	6		*
8	4	6	82	MMSE-SIC
9	6	6	96	MMSE-SIC

*Time is in seconds

RESULTS AND FUTURE SCOPE

Form above simulation results it can be concluded that for setting fixed transmission channel at tx=2 , Maximum Like hood technique yields the lowest bit error rate but while increasing the no. of transmission channels (Both Receiver and Transmitter) then Minimum Mean Square Error- Successive interference Canceller yields to lowest bit error rate.

It can Be updated to 256 bit QAM by inserting its Quadrature matrix and can be checked which detection scheme shows lowest BER, it can also be updated in terms or transmitting and receiving antennas.

REFERENCES

1. http://www.radio-electronics.com/info/rf-technology-design/modulation-techniques/modulation-basics-tutorial.php
2. http://in.mathworks.com/help/matlab/gui-building-basics.html
3. http://publik.tuwien.ac.at/files/pub-et_9714.pdf