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DIFFERENT MODULATION TECHNIQUES PERFORMANCE FOR MIMO

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ABSTARCT:
In this paper we have discussed Different Modulation techniques Performance with Multiple Input Multiple Output (MIMO) in Wireless medium for the comparison we calculate and plot graph Bit Error Rate (BER) Vs Signal to Noise Ratio (SNR). MIMO improve the throughput in wireless medium. It achieves a higher spectral efficiency & increases the capacity and reliability of the MIMO systems. The BER performance of BPSK, QPSK and QAM in MIMO systems is analyzed. A comparison of these a modulation is also done.

Keywords: Modulation techniques; BER; MIMO.

1. INTRODUCTION

Today life is impossible without wireless in some form or the other. Currently wireless finds its widest expression in fixed and mobile roles. The demands on bandwidth and spectral availability are endless. Wireless channel modeling has always been the area to active research. It is related to the spectrum. Marconi pioneered the wireless industry 100 years ago. The ever-increasing populations of wireless technology consumers demand faster and more convenient communications, progressively saturating the radio frequency (RF) bands. However, there is limit to the data throughput of the wireless channel. This is termed the channel capacity, the maximum data rate for reliable (error-free) data communication, assuming an involved coding scheme. Shannon defined this capacity in terms of the available bandwidth and signal power [2]. In a digital system, the capacity for a channel of bandwidth *W* perturbed by white thermal noise of power *N*, with an average transmits power of *P*, is given by,

$$C = B \log 2 \ (1 + S/N)$$

The Multi-Input and Multi-Output (MIMO) communication systems provide very high data rates with low error probabilities. In communication, multiple-input and multiple-output, or MIMO, is the use of multiple antennas at both the transmitter and receiver to improve communication performance. It is one of several forms of smart antenna technology. MIMO technology has attracted attention in wireless communications, since it offers significant increases in data throughput and link range without additional bandwidth or transmit power. It achieves this by higher spectral efficiency (more bits per second per hertz of bandwidth) and link reliability or diversity (reduced fading). Because of these properties, MIMO is a current theme of international wireless research. In this paper, we describe a wireless transmission in which we have used the concept of MIMO .Spatial multiplexing technique has been used to increase the channel capacity significantly. BPSK, QPSK, 16 QAM &64 QAM are the modulation techniques in the Rayleigh channel. So Vblast is the detection technique. A comparative study of various modulation schemes for MIMOs and results are shown in the next sections .BER is calculated and analyzed for comparison.

2. MIMO Model

We have shown the model of MIMO in fig-1.At first, the incoming data streams travels through serial to parallel converter and then all the streams are modulated by using BPSK,QPSK,16 QAM,64QAM. After that spatial multiplexing comes into picture. Now all the modulated streams travel through the turbulent environment and then collected by antennas at receiver end. After that all the streams are demodulated and detected by V-BLAST detection technique. Brief introduction of all the techniques and channel model is given below
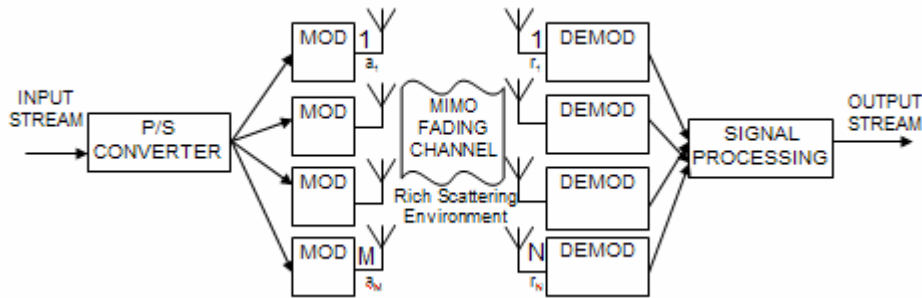
Figure-1 MIMO Link Model

2.1 Modulation Techniques

Modulation is the process of varying some parameter of a periodic waveform in order to use that signal to convey a message. Normally a high-frequency sinusoidal waveform is used as carrier signal. For this purpose ,if the variation in the parameter of the carrier is continuous in accordance to the input analog signal the modulation technique is termed as analog modulation scheme if the variation is discrete then it is termed as Digital Modulation Technique. Types of modulation techniques are present in table 2.1

Table- 2.1: Type of Modulation Techniques

Sr. No.	Modulation	Techniques	Type Notation
01	Analog Modulation Techniques	(i) Amplitude Modulation (ii) Frequency Modulation (iii) Phase Modulation	A.M. F.M. P.M.
02	Digital Modulation Techniques	(i) Amplitude Shift Keying (ii) Frequency Shift Keying (iii)Phase Shift Keying	A.S.K. F.S.K. P.S.K.

In this an M message bits are encoded by transmitting a single pulse in one of $2M$ possible time-shifts. This is repeated every T seconds, such that the transmitted bit rate is M/T bits per second. There are four modulation techniques used for it that are Binary phase shift modulation (BPSK), Quadrature phase shift modulation(QPSK), and 16-Quadrature Amplitude modulation(16- QAM). The no. of points on constellation is related to the no. of QAM.

3. Simulations and Results

We have simulated the MIMO channel with channel state information known only at the receiver Performance evaluation in terms of BER with respect to SNR was carried out using MATLAB environment by transmitting modulated data streams in blocks of 10,000 bits each using Rayleigh channel model. Figure2,3, shows the performance of BPSK, QPSK, 16 QAM and 32 QAM modulation schemes respectively. M denotes the no. transmitter antennas and N denotes the no. of receiver antennas. With the change
 in M and N the BER V/S SNR is calculated for BPSK, QPSK, 16 QAM modulation schemes. MIMO and with the increase of no. of antennas the performance also increases. BPSK and QPSK show better response at lower SNR but 16 QAM show better results at higher SNR.
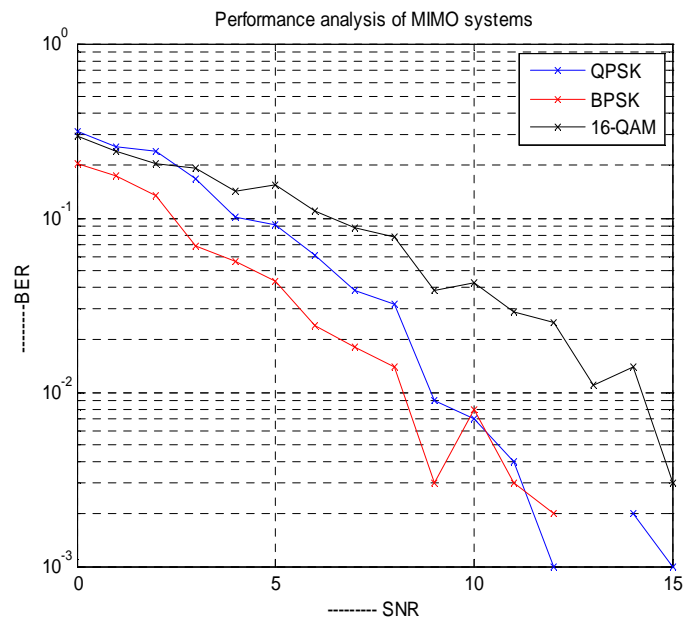
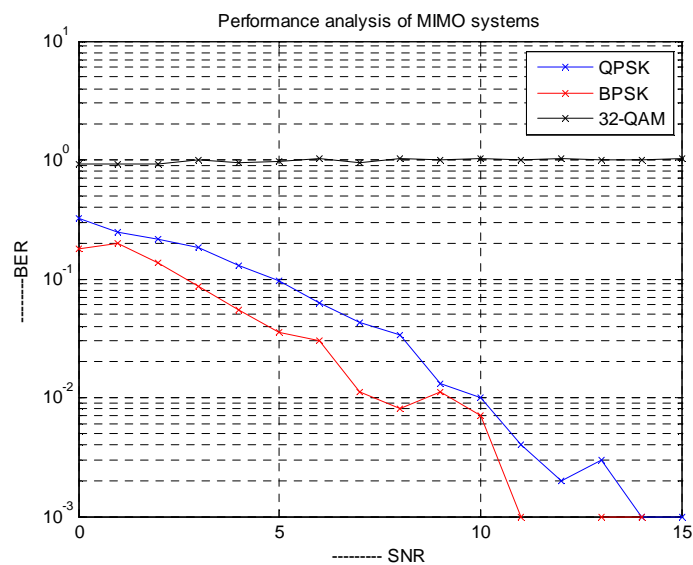Figure 2-BER Vs SNR performance of MIMO with 16 QAM

Figure 3-BER Vs SNR performance of MIMO with 32 QAM

3. CONCLUSION

From the above discussion, we can say that MIMO give better response and increased channel capacity in every modulation scheme. Various Modulations are compared with respect to BER and BPSK is the power efficient modulation technique as compared to other techniques. BPSK and QPSK show better response at lower SNR but 16 QAM show better results at higher SNR. Its results are more satisfactory.

References

[1] Madan Lal "BER Performance of Different Modulation Schemes for MIMO System", IJCSNS International Journal of Computer Science and Network Security, VOL.11 No.3, March 2011.

[2] C. E. Shannon, "A Mathematical Theory of Communication," *The Bell System Technical Journal,* vol. 27, pp. 379{423, 623{656, Jul., Oct., 1948.

[3] Javad Ahmadi Shokouh, Thesis of Doctor of Philosophy In Electrical and Computer Engineering Waterloo, Ontario, Canada, 2008 on"Receive Soft Antenna Selection for Noise-Limited/Interference MIMO Channels ".

[4] Theodore Rappaport, Wireless Communication, 2nd edition page 241

[5] Ilan Hen, "MIMO Architecture for Wireless Communication", *Intel Technology Journal*, Vol. 10, Issue 2, 2006.

[6] G.D. Golden, G.J. Foschini, R.A. Valenzuela and P.W. Wolniansky "Detection Algorithm and Initial Laboratory Results using VBLAST space time communication Architecture" *Electronics letters*, 7th January1999, Vol.35 No.1

[7] Major Harinder Singh Sandhu, Thesis of Master Of Technology: Power Efficient Free Space Optical Multiple Input Multiple Output Wireless Communication,