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RESEARCH ARTICLE

MULTIPLE ACTIVE SPATIAL MODULATION IN MIMO SYSTEMS.

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Abstract

Multiple Active Spatial Modulation (MA-SM) is a very popular scheme for MIMO systems. MA-SM scheme is used to achieve high diversity, high transmission rate and multiplexing gain with minimum number of active transmit antennas. It also reduces the interchannel intereference and interantenna interference. In this paper, we discuss the comparision of MA-SM with.

Introduction:-

Multiple input multiple output (MIMO) is a revolution in the field of wireless communication. It improves the capability and reliability of the system. Several MIMO techniques such as space time block code and spatial multiplexing implementing diversity and multiplexing gain respectively. Decoding complexity is less in STBC. It is simple to implement and it has high spatial diversity gain.
V-BLAST transmits information bits simultaneously over all the antennas. It has high multiplexing gain. But due to simultaneous transmission interchannel interference (ICI) and interantenna interference (IAI) is high in the system.
Higher capacity could be achieved by combining the amplitude/phase modulation (APM) with antenna index modulation, known as Spatial Modulation (SM)[3]. Only one antenna is active at each time instant. This reduces the interchannel interference and interantenna interference it also reduces system complexity.

GSM overcome the limitation of spatial modulation. At allows multiple antennas active at a time. It has high spectral efficiency but increase system complexity exponentially with the increase number of transmit antennas.

System Model:-

In MA-SM system, the information bits are transmitted through the selected active antennas. Along with symbol information, the active antenna information is also transmitted [2]. System has N_t transmit antennas and N_r receive antennas. N_p is the number of active antennas from N_t transmit antennas. The symbol is mapped through a M-QAM (M- Quaderature Amplitude Modulation) and transmitted through a Rayleigh fading channel. At the transmitter side signal are converted from serial to parallel form. Hence huge data can be transmitted simultaneously. At the receiver side signal is converted from parallel to serial form. This is the inverse of the transmitter.

Transmitter:-
The working of MA-SM transmitter as follows:

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1. From N_t transmit antennas N_p active antennas are selected to transmit information.
2. Denote the possible antenna group as A.
3. Bit sequence of length $\log_2 \left\lfloor \begin{matrix} N_t \\ N_p \end{matrix} \right\rfloor$ is transmitted through the N_p antennas.
4. The information bits are divided into N_p+1 streams in which N_p are mapped into QAM symbols selected from M-QAM symbols and the other one for antenna group detection.
5. The rotational angle θ of signal vector is determined for each X, so that more diversity gain can be achieved.
6. The symbols transmitted through N_p active antennas and the channel is Rayleigh faded channel.

Receiver:-

The working of MA-SM receiver as follows:

1. Received symbols are decoded by M-QAM demodulation.
2. Using the maximum ratio combining technique, the signal is detected from the diversity branches having highest SNR.
3. The receiver knows the knowledge about channel state information.
4. Syndrome decoding takes place with minimum hamming distance.
5. Therefore the original signal is detected

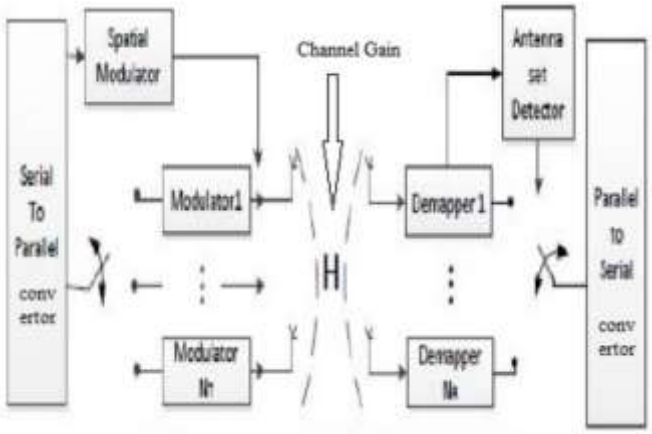

Fig. 1:- System Model.

Comparison:-

Table 1:-Comparison of BER of various MIMO techniques such as STBC, V-BLAST and MA-SM using modulation schemes (BPSK, QPAK,16-QAM) are as follows:

MIMO Techniques	STBC	V-BLAST	MA-SM
BPSK	High	Moderate	Low
QPSK	High	Moderate	Low
16-QAM	High	Moderate	Very low

Conclusion:-

In this paper, a novel high rate low complexity MIMO technique called MA-SM is proposed. Here we are comparing the bit error rate (BER) of various existing MIMO techniques such as STBC, V-BLAST with MA-SM using different modulation schemes (BPSK, QPSK, 16-QAM). From table 1 we can conclude that MA-SM produce better performance. MA-SM with 16-QAM modulation scheme is the efficient technique for high data rate communication system.

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