ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

Multilayer Codes for Joint Single Decoding Using Iterative Algorithm

G.Annalakshmi[1], K.Rajkumar[2], I.Arivazhagan[3], M.Arulaalan[4]

Abstract— To design the MIMO network models with multi user multiple antennas and to determine the parameters of the multilayer coding using joint-single decoding and soft cancellation method. By using Channel State Information (CSI) the original source signal at the destination is reconstructed. the different error protection level is achieved by assigning the different coding redundancies to each layer. Thus to maximizes the average receiving rate at the destination, multilayer codes are designed.

***Index Terms*— BER, CSI, channel SINR, Iterative Decoding, MIMO, SINR etc.**

I. INTRODUCTION

A relay channel is defined as a probability model in communication theory which communicates between sender and receiver based on one or more immediate nodes. It is a combination of the broadcast channel and multiple access channels. The multitude relay channel is introduced for the application of multifarious communication channel for the more users exchange information with the use of a relay bounding. In general, the use of multiple antennas at both the transmitter and receiver which is termed as MIMO is used to improve the performance of the communication. MIMO comes under the technology of smart antenna. In MIMO the terms input and output denotes the radio channel carrying the signal and not to the devices having antennas.

Due to the increase in data throughput and transmitter power with additional bandwidth, MIMO technology has been preferred for wireless communication. The main goal of the MIMO is to scatter the total transmit power over the antennas to attains an array gain that improves the spectral and a diversity gain that improves the link trustworthiness. The wireless standards IEEE 802.11n (Wi-Fi), 4G, 3GPP Long Term Evolution, WiMAX and HSPA+ uses MIMO technology. A wide category of network analysis usually used in wireless networks, where the source and destination are organized through resources of several nodes is called as a relay networks. In such a network the source and destination cannot communicate to each other directly because the distance between the source and destination is larger than the transmission range of both of them, thus requires intermediate node. When compared to SISO systems MIMO systems are more complex but they have numerous connections which help to map from beginning to end very promptly, methodically, and successfully.

A. Rate less Coding for Gaussian Channel

[2] A rate less code i.e., a rate companionable groups of codes has the assets that code words of the superior rate codes are prefixes of individuals of the inferior rate. An ideal group of such codes is solitary in which each of the codes in the groups is ability-achieving. Thus constructing with the aim of ideal rate less code with small complication the decoding algorithms exists for additive white Gaussian noise channels. The construction includes the use of layered encoding and successive decoding, collectively with replication using time-varying layer weights. Slight differences in the basic construction are also developed, together with the time varying channels in which there is no a priori stochastic model.

B. Existing System

A novel source and channel coding procedure is established to sustain the transmission of higher data rate. [1]The design of multilayer coding method for a mono-consumer quasi-static fading MIMO system, the CSI is acknowledged merely at the destination. The Multilayer coding scheme is designed for the application of mono and compound antenna system. The designed code performance is estimated for different network arrangements. The phase angle and the number of channels used in the antenna level is determined and also the CSI information received range is explained.

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

II. NETWORK MODEL

Consider a MIMO channel with M transmits antennas and *N* receives antennas which connects a source to a destination

$$W = Gr + f \quad (1)$$

Where **r** and **w** are *M*-dimensional and N-dimensional vectors, respectively. An additive noise vector **f** is a **N** dimensional vector with zero-mean complex Gaussian distribution independent and identically distributed entries. The channel propagation matrix **G** is assumed to be a circularly symmetric $N \times M$ matrix with entries that have zero mean independent and identical distributions.

A. Multilayer Coding for Single Antenna System

Multilayer approach can be wide spreaded for illustrating the MIMO propagation upper bound. It boosts the potential gains in MIMO broadcasting through the most advantageous methods such as, 1. Continuous broadcasting 2. Finite level coding 3. Multi-access permutation codes. A Hadamard transform is balanced with a diagonal permutation code, which are having the comparable performance. Diagonal permutation reduces the implementation complexity in the broadcast method; the differential data rate of each code layer is defined as:

$$\zeta(l)\,dl = \log\left(1 + \frac{I_{\rho(l)dl}}{1+I\,I(l)}\right) \overset{(a)}{\Rightarrow} \frac{I_{\rho(l)dl}}{1+I\,I(l)} \quad (2)$$

where $(l) = \int_l^{\infty} \rho(a)\,da$.

The decodable rate at the destination can be calculated as:

$$R(S) = \int_0^S \zeta(a)\,da \quad (3)$$

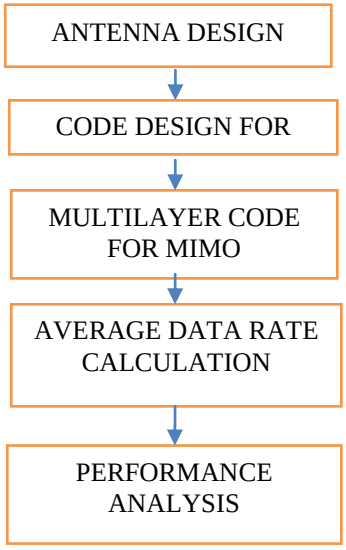
The receiver can calculate approximately using the channel fading coefficients with high precision. The broadcast approach make possible reliable transmission rate modified to the real channel circumstances, without any feedback from receiver to transmitter. The layered coding recommends the unequal error protection on the transmitted data loss of successive decoding. [4]"Multilevel Coding strategy for Two-hop single-user Networks propose that Two-hop network in which information is transmitted from a source via a relay to a destination. Channels are quasi-static fading with additive white Gaussian noise and that all nodes are outfitted with a particular antenna. The channel state information (CSI) of each step is presented only at the equivalent receiver and relay is not competent of data buffering over multiple coding blocks. The infinite-layer DF coding system with a appropriate power distribution exploits the statistical average of the received rate at the destination.

$$R_{avg} = \int_{l_b}^{l_e} \left[1 - F_{U^{I(l)}}\left(\frac{\zeta(l)}{-I'(l)}\right)\right]\zeta(l)\,dl \quad (4)$$

III. PROPOSED SYSTEM

In the proposed system, a novel source and channel coding procedure is introduced to maintain the transmission of higher data rate used in multiple layers. An iterative decoding algorithm is used to perform the joint single decoding and soft cancellation of the interference from other codes. The proposed method is compared with the various transmission schemes available in existing method. The bit error rate is calculated for the existing successive decoding and the proposed joint-single decoding. It is found that the error rate of proposed is reduced compared to existing. The proposed system is explained using a block diagram.

BLOCK DIAGRAM



ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

A. *Antenna Design*

Antennas are mandatory for every radio receiver or transmitter to link its electrical connection to the electromagnetic field. The performance limitation of single user MIMO procedures is defeated by Smart antenna method. The number of transmit antennas at the base station should be increased up to 8-64.

B. *Multilayer Code Construction for MIMO*

To maximize the throughput in multiple receive antenna systems, multi-stream transmission is commonly essential. To maintain multi-layer transmission in multi-antenna wireless communications precoding is used. Multilayer space-time code designs for two and three transmit antennas.

C. *Iterative Decoding*

The purpose of iterative coding is to offer a soft estimate of the sequence at the time of code decoding. Decoding and soft cancellation is repeated for all codes until consistent decoding is attained. The final and hard decision on the code information sequence is obtained at the final iteration.

D. *Multi-Layer Code Design for MIMO*

Multilayer interleave-division multiplexing coding scheme can be used to attain transmission rate. It consists of an encoder, an interleaver, a power factor module, a summing module and an antenna. *A* posteriori probability decoders operating iteratively is allotted for decoding function.

E. *Determining Parameters of Multi-Layer Code*

Merely the information of particular or a collection of interleavers and de-interleavers is required to accumulate the codes. As a result a number of memories are saved and the complexity of the system is also reduced. Thus the Quantization is to be performed. CDF and PDF values as well as rate of each code layer in Successive decidability are found which should satisfy the condition.

IV. SIMULATION RESULTS

The MATLAB tool is used to simulate the multilayered codes. Fig- 1&2 is the response curve of the multilayer codes by using phase angle and the SINR. The phase angle is used to calculate the transmitted channel level of the antenna. SINR is Signal Interference to Noise Ratio which is used to determine the eminence of wireless communication. Fig-3 is the cumulative distribution function which is used to calculate the random variable of the data which was transferred by the transmitter. The Fig-4 explains the average bit error rate which is calculated at the receiver for multilayer design. In this the channel state information at the receiver is used for recovering the original message. In this figure it the average bit error rate is compared with the existing algorithm.

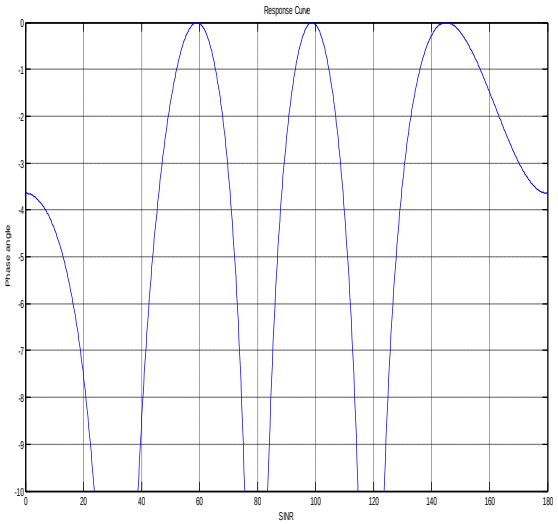


Fig-1: Phase angle Vs SINR

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

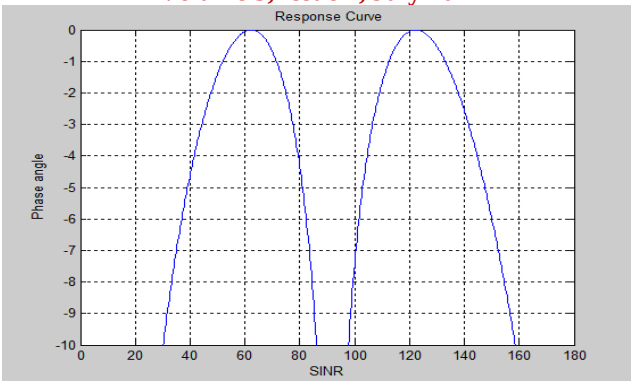


Fig-2: Phase angle Vs SINR

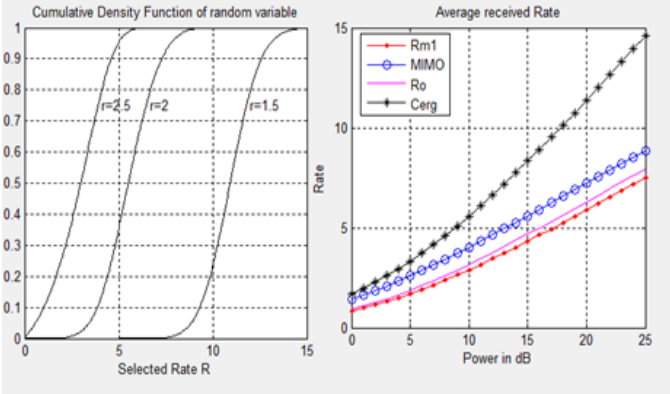


Fig -3: Cdf Curve

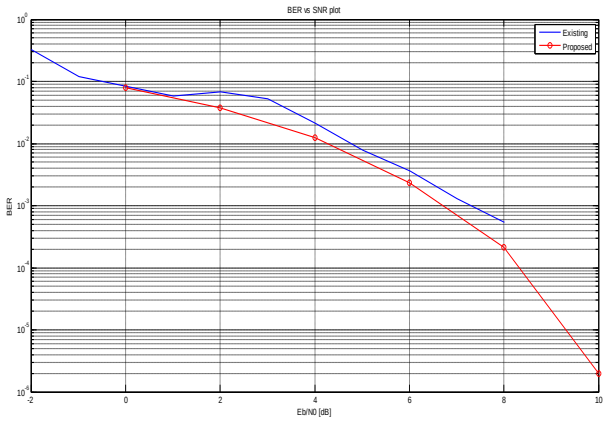


Fig- 4: BER Vs. Eb/N_0(dB)

V. CONCLUSION

The modified decoding technique with joint-single decoding and soft cancellation technique which comes under iterative decoding has been implemented to maximize the average receiving rate at the destination. The error rate calculation for the proposed decoding scheme outperforms the existing successive decoding in multilayer codes.

REFERENCES

[1] Vahid Pourahmadi, Abolfazl S. Motahari, and Amir K. Khandani, "Multilayer Codes for Broadcasting over Quasi - Static Fading MIMO Networks", in IEEE Transactions on communications, vol. 61, no. 4, April 2013.

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

[2] U. Erez, G. Wornell, and M. Trott, "Faster-than-Nyquist coding: the merits of a regime change," in Proceedings 2004 Allerton Conf. Communications, Control Computing.

[3] A. Steiner and S. Shamai, "Multi-layer broadcasting over a block fading MIMO channel," IEEE Transactions on Wireless communications, vol. 6, no. 11, pp. 3937–3945, 2007.

[4] V. Pourahmadi, A. Bayesteh, and A. K. Khandani, "Multilevel coding strategy for two-hop single-user networks," in Proceedings 2008 Symp. Commun., pp. 115–119.

[5] A. Tulino, A. Lozano, and S. Verdu, "Capacity-achieving input covariance for single-user multi-antenna channels," IEEE Transactions on Wireless communications, vol. 5, no. 3, pp. 662–671, 2006.

[6] K. Petersen and M. Pedersen, The Matrix Cookbook. Technical University of Denmark, 2006.

[7] I. E. Telatar, "Capacity of multi-antenna Gaussian channels," Bell Labs, Lucent Technologies. Available: http://mars.bell-labs.com/papers/proof/ proof.pdf, Tech. Rep., 1995.