Diversity combining techniques using LPDC coding in OFDM

Karamjeet Singh, Komal Arora

Department of Electronics Engineering
Lovely Professional University, Punjab
Department of Electronics Engineering
Lovely Professional University, Punjab

Abstract-For The Enhancement of BER In Communication System We Use The Different Type of Channel coding, LDPC(low density parity check) are the codes Which are used in channel coding for the different enhancement in the system performance. We are trying LDPC channel coding with BPSK modulation scheme with MRC and EGC at the receiver over Rayleigh fading channel. BER Performance of System is analyzed with And without LDPC channel coding.

Keywords- OFDM MIMO, Low density parity check, Maximal ratio combining, Equal gain combining.

I. INTRODUCTION

Orthogonal frequency-division multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies. OFDM has developed into a popular scheme for wideband digital communication, whether wireless or over copper wires, used in applications such as digital television and audio broadcasting, DSL broadband internet access, wireless networks, and 4G mobile communications.[1] In radio Communication, multiple-input and multiple-output, or MIMO (commonly pronounced my-moh or me-moh), is the use of multiple antennas at both the transmitter and receiver to improve communication performance. Diversity is a powerful communication receiver technique that provides wireless link improvement at a relatively low cost. Diversity techniques are used in wireless communications systems to primarily to improve performance over a fading radio channel. Low-density parity check (LDPC) codes [1], are equipped with very fats encoding and decoding algorithm which makes them very useful for practical applications. The main attraction of LDPC codes is that they approach the Shannon limit of channel. There have been simulations that perform within 0.04dB of the Shannon limit. The LDPC codes are characterized by a sparse parity check matrix in which the number of 1’s is very less as compared to the number of 0’s [2]. LDPC codes have been proved to achieve capacity on binary erasure channels (BEC). Unlike turbo codes, they can be optimized for good bit-error rate performance over a given channel and for a given code-rate [3], maximal-ratio combining (MRC) is a method of diversity combining in which the signals from each channel are added together. The gain of each channel is made proportional to the rms signal level and inversely proportional to the mean square noise level in that channel equal-gain combining (EGC), which co-phases the signals on each branch and then combines them with equal weighting. Performance of EGC is quite close to that of MRC, typically exhibiting less than 1 dB of power penalty.

II. LDPC RESEARCH

Satoshi Gounai et al. [4] find result that the SNR thresholds of a regular LDPC codes and the irregular LDPC codes and optimum degree distributions of the irregular LDPC codes for SIMO systems with several diversity orders. Eric Villier [5] drived the performance of optimum combining in the presence of multiple equal power interferers and noise when there is less no. of the interferers than the number of antenna elements. We have Desired signal and interferers which use flat Rayleigh fading and there are propagation channels which are independent. the probability density function (PDF) of the output signal-to-interference-plus-noise ratio (SINR), cumulative distribution function (CDF) of the SINR and the bit-error rate (BER) of some binary modulations has been derived using the rayleigh fading.

Kwok Hung Li et al.[6] drived that the Low-density parity-check (LDPC) codes when combined with Selection ratio combining and Maximal ratio Combining gives better bit-error rate (BER) performance then multipath fading channels. We used the GA approach with the LDPC over the i.i.d Nakagami-fading channels to find the BER.

Mackey et al. [7] proposed that the most powerful error correcting codes LDPC is based on very sparse matrices that gives better results then the turbo codes. These results using LDPC codes gives results close to Shannon capacity for binary- symmetric channel and symmetric stationary ergodic noise.

S. Sharma et al. [8] deigned that LDPC codes have much better gives much better performance in some cases than
Vishwanatha R. Gowda et al. [9] calculated the Error performance of selection diversity (SD) receiver with non-identical fading channels, in which the fading statistics of each branches are different. Bit-error rate (BER) results are calculated from the cumulative distribution function (CDF), which reduces the complexity and give simple BER expressions.

III. PROPOSED WORK

LDPC channel coding is used for the better results of BER and SNR of the system. In this we have joined LDPC coding with the BPSK modulation for the MRC diversity to improve the BER of Rayleigh fading channel. We have calculated that BER of OFDM is decreasing using LDPC coding techniques.

IV. CONCLUSION

Diversity Such as Maximal Ratio Combining and Equal Gain Combining is important for the OFDM system performance in wireless communication system. It reduces the effect of fading and give better BER.

From the comparing study we have concluded that BER of OFDM is decreasing using LDPC codes and Diversity combining techniques over the faded channel.

V. FUTURE WORK

By using the channel LDPC coding with diversity combining technique such as MRC/SC, the BER performance of system is improved. This system is implemented over the independent and identically distributed Rayleigh channel fading. It can be further implement on the correlated Rayleigh fading channel.

In this thesis, we have not used any type of interference. We use only noise. So we can extend this work over the interferers which may give equal power or not.

REFERENCES


