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Performance Analysis for MIMO System with Deletion Based on Turbo Code

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Abstract
A new channel model suitable in certain application is described. The synchronization errors which occurred in multiple transmitter and receiver are considered in this channel model, based on Low density parity check code. A detector is proposed in order to achieve synchronization and detection for MIMO deletion channel. By combining proposed detector with LDPC code can achieve powerful error correction capabilities and Reliable transmission over MIMO deletion channel is viable to achieve a better performance, turbo code is proposed.

Keywords
MIMO, Deletion channel, LDPC Code, Turbo Code MAP detector

I. Introduction

In this work channel is modelled with synchronization errors due to the mismatches between the transmitter and receiver clocks using bit drop-outs (deletions).[3]

Each bit is received independently in the binary symmetric channel with error probability P where each bit is erased, Shannon invented the fundamental results through the development as well as analysis of low density parity check code and based on the capacity of such channels. It is easier to analyse the achievement of maximum capacity performance for these channels with more perfectness. To understand better, considering a channel, n bits are sent where each bit is independently deleted with fixed probability P. Such type can be called as binary independent and identically distributed deletion channel, which may be often called as binary deletion channel. Eraser channel is quite different from deletion channel. Since with an erasure channel ,while after sending n bits, n symbols are received, a third symbol often denoted as'?' is achieved at the receiver to indicate an erasure. consider 10001010 was sent the receiver obtains 10011 the third, sixth, eighth bits are deleted and would attain 10?01?1? in case if the bits were erased. Channels with synchronization errors including both insertion and deletions as well as more general timing errors were expected.

The previous works includes the use of single transmitter and a single receiver. Many applications involves the use of multiple-transmit and multiple-receive elements. The main objective of this work is to bring about a new channel modelling synchronization errors by considering possible mismatches between different transmit and receive element pairs, [5] and a practical channel coding solution for reliable communication is considered. Special focus is made on the case of deletion type synchronization errors (i.e., the MIMO deletion channel) for understanding the incorporation of insertion type errors is also possible in a similar manner.[2]

The MIMO deletion channels model is enthused by some practical digital communications applications, In this work N ×M MIMO channel is considered with deletion errors. Unambiguously, symbols may be deleted independently of each during transmission. This model is an extension of the identically distributed deletion channel model for the single input single-output communications scenario.[4] symbols are modulated using binary phase shift keying and the effects of the electronic noise at the receivers are considered. To make a reliable communication over the MIMO deletion channel, the coding scheme, is LDPC code, and At the receiver, a bit level maximum-a-posteriori (MAP) detector is set up which jointly achieves synchronization for the deletion channel and detection for the MIMO channel. The resulting flexible information is then fed to the message passing decoder [6]

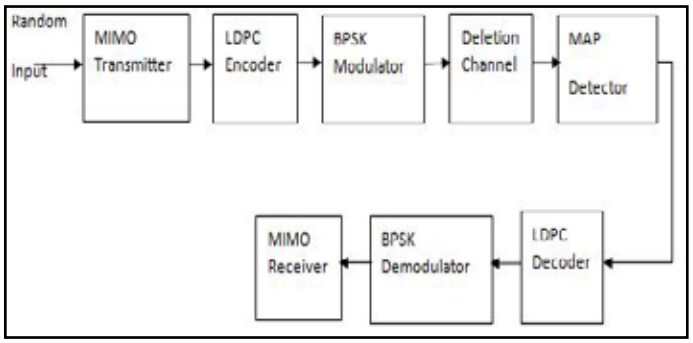

Fig. 1: Block Diagram for MIMO Deletion Channel

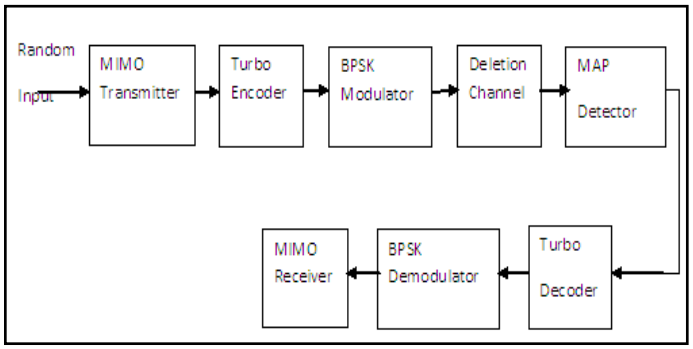

Fig. 2: Block Diagram for MIMO Deletion Channel Using Turbo Code.

II. Ststem Model

In this paper MIMO deletion channel is considered, mainly on the case of N = 4 and M = 4 channel model is shown in fig 1, The information bits are encoded by LDPC.The encoded sequence is modulated by using BPSK . by reason of I.I.D deletions, random symbols get deleted. In LDPC decoder Bit node and Check node units communicate with each other to detect and correct the errors present in the transmitted data. The communication between bit node and check nodes is iterative. This process ends when the decoder converges to a code word or maximum iteration length is reached.

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A. Detection Algorithm

The MAP can be used to obtain a point estimate of an unobserved quantity on the basis of empirical data.

It is closely related to fishers method of likelihood, but employs an augmented optimization objective which incorporates a priorier distribution over the quantity one wants to estimate. MAP estimation can therefore be seen as a regularization of ML estimation. Maximum –a-posteriori detector is deployed which jointly achieves synchronization for the deletion channel .The Maximum –a-posteriori detector is used to detecting the channel interference. The resulting output information is then fed to the decoder. The joint MAP detector generates soft information for all the LPDC-coded bits based on the received signals ,

$Y_1 = y_{1,1}, y_{1,2} \cdots y_{1,r}$ and $Y_2 = y_{2,1}, y_{2,2} \cdots y_{2,r}$, where R = max (R1,R2). Similar to the general Forward Backward Algorithm (FBA), we define the state of the trellis to be $s_n = (d_{1,n}, d_{2,n})$, where di,n denotes the total number of deletions for the ith stream of bits at time n.

The forward and backward quantities:

$$\propto_n (s_n) = P\left(s_n = (d_{1,n}, d_{2,n}), Y_1^n\right),$$

$$\beta_n(s_n) = \mathrm{P}\,(Y_{n+1}^R \mid s_n = (d_{1,n}, d_{2,n})),$$

III. Simulation Results

In this paper, coding scheme with the mean of signifying reliable communication through MIMO deletion channel . Due to its high efficiency low density parity check code can provide performance close to channel capacity, Exploiting the detection algorithm to plot the error rate performance for different code rate values. At code rate of 1, 0.0047 bit error rate is achieved.

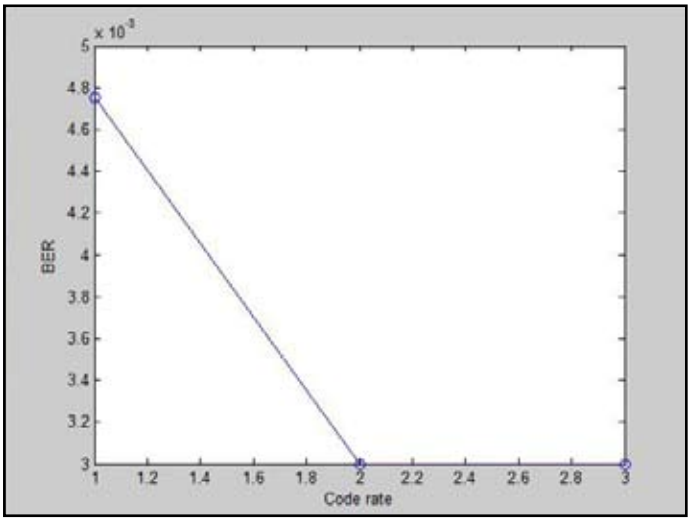

Fig. 3: BER Analysis for LDPC

1. Proposed Method

(i). Turbo Code

Compared to the low density parity check code bit error rate is minimized (by using turbo code 0.00000001 is achieved).

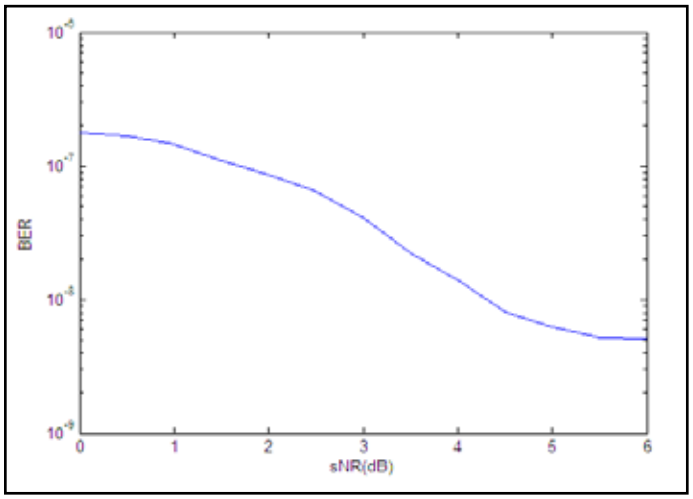

Fig. 4: BER Analysis For Turbo Code

IV. Conclusion

A new channel model for MIMO communication with synchronization errors i.e. deletion errors whose error detection and correction is achieved by maximum a posterior detection algorithm. Coding scheme over such channel is considered by low density parity check code and their performance is studied by simulation when compared with LDPC code, turbo code aids in minimizing bit error rate.

References

[1] *Feng Wang and Tolga M. Duman, Fellow," Multi-Input Multi-Output Deletion Channel" IEEE Communications Letters, vol. 16, no. 11, pp1729, November 2012.*

[2] *M. C. Davey and D. J. Mackay, "Reliable communication over channels with insertions, deletions and substitutions," IEEE Trans. Inf. Theory,vol. 47, no. 2, pp. 687–698, Feb. 2001.*

[3] *F. Wang, D. Fertonani, and T. M. Duman, "Symbol-level Synchronization and LDPC code design for insertion/ deletion channels," IEEE Trans.Commun., vol. 59, no. 5, pp. 1287–1297, May 2011.*

[4] *T. M. Duman and A. Ghrayeb, Coding for MIMO Communication Systems. John Wiley & Sons, 2007.*

[5] *M. Mitzenmacher, "A survey of results for deletion channels and related synchronization channels," Probability Surveys, pp. 1–33, June 2009.*

[6] *R. G. Gallager, "Sequential decoding for binary channels with noise and synchronization errors," MIT Lincoln Lab., Tech. Rep., Oct. 1961.*

[7] *D. Fertonani and T. M. Duman, "Novel bounds on the capacity of the binary deletion channel," IEEE Trans. Inf. Theory, vol. 56, no. 6, pp.2753–2765, June 2010.*

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