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ERROR REDUCTION USING DFE IN MIMO-OFDM

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ABSTRACT- Equalization is a technique used to reduce the bit error rate and ISI. Different type of equalization technique are there, here taking decision feedback equalizer. In DFE using previous bit to take decision. First proposing MIMO-OFDM system frame work, MIMO system containing number of transmit and receive antennas, which will be increase the reliability and capacity of the system. In OFDM means here numbers of carriers are used to transmit data and also they are orthogonal to each other. The combination of MIMO-OFDM provides better performance of the system. Channel prediction is a technique used to remove the performance degradation due to the feedback delay of the channel state information. Here taking two predictors and choose the better one according to the BER and SNR. End of the receiver side use the equalizer for getting low BER.

Keywords- [MIMO-OFDM, Channel prediction, DFE, BER]

1. INTRODUCTION

Multiple input multiple output orthogonal frequency division multiplexing (MIMO-OFDM) [8] is considered to be a promising technique for reliable high data-rate wireless transmission systems, which can provide high spectral efficiency and high data rate transmission over frequency selective channels [2].

The principle of OFDM is to divide a single high-data-rate stream into a number of lower rate streams that are transmitted simultaneously over some narrower sub channels[10]. Hence it is not only a modulation (frequency modulation) technique, but also a multiplexing (frequency-division multiplexing) technique. Channel prediction is an appealing technique to mitigate the performance degradation due to the inevitable feedback delay of the channel state information (CSI) in modern wireless systems [1]. Different type of channel prediction techniques are there, in this project taking all correlation predictor and FSS predictor for comparison of signal to noise ratio and bit error rate. After comparison finalizing which one is best performer and choose them with this project. At last in the receiver side use a decision feedback equalizer for improves the performance of the system according to the bit error rate.

2. MIMO-OFDM SYSTEM MODEL

The main aim of adding OFDM in MIMO for converting frequency selective MIMO channel into frequency flat fading channel. Which provide multichannel equalization is simple.

MIMO-OFDM system consist of M transmit antennas and N receive antennas and k subcarriers.$X_m(i,k)$is the transmitted symbol in the M thsymbol time and k th subcarrier. Then the received symbol is represented as

$$Y_n(i,k) = \sum_{m=1}^{M} H_{n,m}(i,k)X_m(i,k) + Z_n(i,k) \quad [1]$$

Where Hn,m(i, k) is the frequency response of the channel impulse response (CIR) at the k-th subcarrier and the i-th symbol time for the (m, n)-th antenna pair. Zn(i, k) is the background noise plus interference term of the n-th receive antenna. The k subcarriers are first passed to the modulator her a BPSK modulator scheme is used. Then perform a IFFT operation. A cyclic prefix is added to the k th subcarrier. Which means that when transmitting k samples take the last samples and they prefix in to the beginning of the transmitted samples like a cyclic movement.

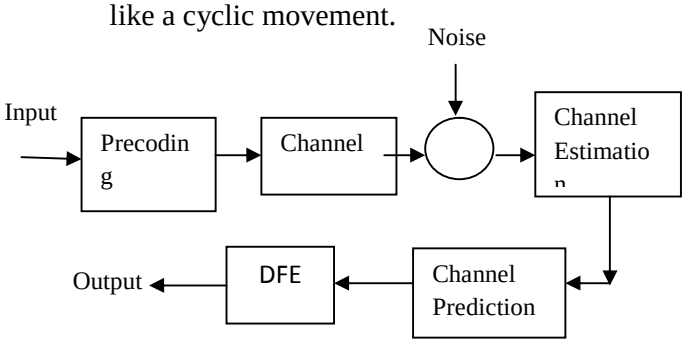

Figure 1- MIMO-OFDM system model

3. PREDICTION ALGORITHM

Channel prediction is a technique used to mitigate the performance degradation due to the channel state information(CSI)[8].CSI can be obtained by feedback of the channel estimate from the receiver or transmitter's estimation in time domain duplex [2].There are different type of prediction algorithms. Here we choose all correlation predictor and FSS predictor.in all correlation comparing these two by using BER and find out system performance. The impulse response of the wireless channel can be represented as

$$h_{n,m}(t,\tau) = \sum_{l=0}^{L_{n,m}-1} h_{n,m}(t,l)\delta(\tau - \tau_{n,m}(l))) \quad [1]$$

where $L_{n,m}$ is the number of multiple radio p-th antenna pair, $\delta(\cdot)$ is the Kronecker delta function $\tau_{n,m}(l)$ and $h_{n,m}(t,l)$ are the delay and complex-value CIR at time t ofthe l-th path from the (m,n) antenna pairrespectively.

4. DECISION FEEDBACK EQUALIZER

A decision feedback equalizer is a non-linear equalizer that uses previous detector decisions to eliminate ISI on the current received symbol. The equalizer consist of feed forward filter, feedback filter and adetector[13]. FF and FB tap weight are simultaneously adjust for minimizing mean square error. The DFE process the received data in iterative fashion [13]

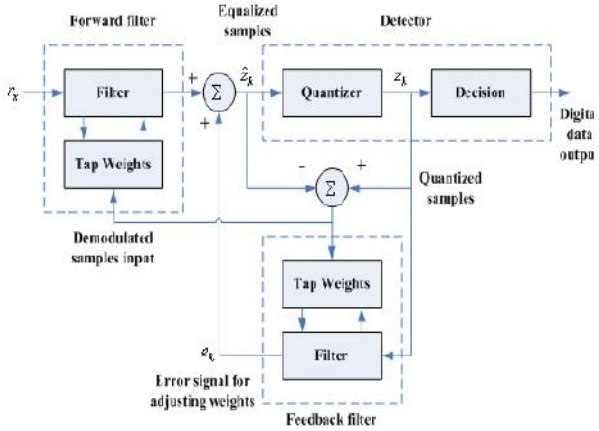

Figure 2- Decision Feedback Equalizer [12] Least mean square algorithm [12] is used for finding errors in the samples.

5. SIMULATION RESULT

MIMO-OFDM system is considered to simulation. The simulation is performed

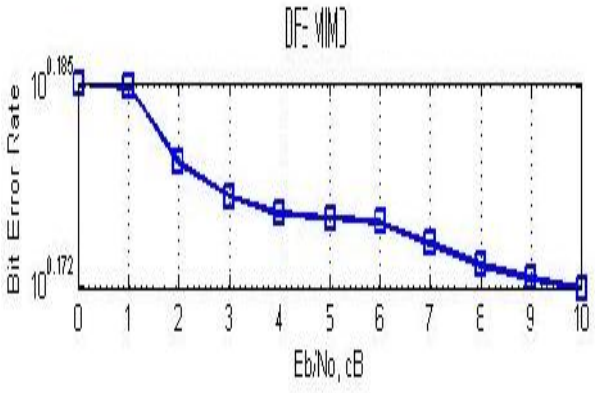

Figure 3- Performance of the system using FSS predictor with DFE

using MATLAB. The performance of the system is determined by comparing BER of all correlation predictor, FSSpredictor without DFE and FSS predictor with DFE. First comparing all correlation predictor and FSS predictor, then add a DFE in FSSpredictor output. Simulation result show that using a DFE in FSS predictor it will bereduce the error in the information predictor output. Simulation result show that using a DFE in

FSS predictor it will be reduce the error in the information.

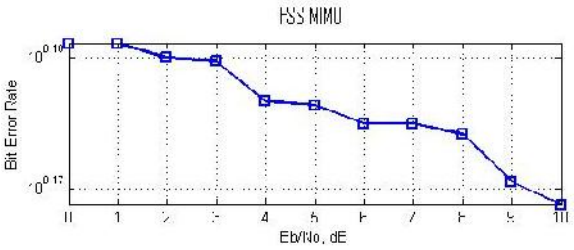

Figure 4- Performance of the system using FSS predictor with DFE

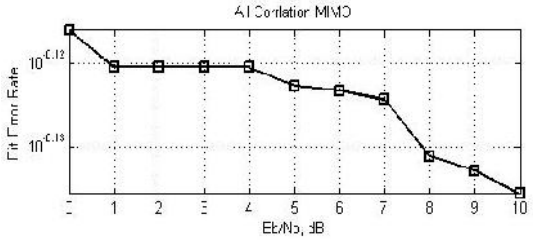

Figure 5- Performance of the system using all correlation predictor

FFT size	64
Number of subcarriers	52
Modulation	BPSK
Channel Model	Rayleigh
Number of Tx and Rx	2
Equalizer	DFE

Table 1- Simulation Parameters

SNR	1	2	3	4	5	6
BER of all correlation	1.5202	1.5106	1.5096	1.5077	1.5048	1.5038
BER of FSS	0.7635	0.7625	0.7606	0.7558	0.7538	0.7538
BER of DFE	0.5356	0.5337	0.5192	0.5087	0.5029	0.5029

Table 2- Table of comparison

CONCLUSION

In this paper first introducing a MIMO-OFDM system, the combination of MIMO-OFDM will provide highest capacity and data throughput.Then take two predictors for finding better one forthe proposed method by comparing the bit error rate.And select the best one from the two predictors. Then add the decision feedback equalizer. In the simulation result show that the performance of the system will be increased by the decision feedback equalizer in the receiver end.

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