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Design of Low Complexity Channel Estimation and Reduced BER in 5G Massive MIMO OFDM System

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Abstract— In this Project we are going to utilize chaos correspondence to improve bit Error rate (BER) execution of the framework. The current research says that the BER execution of the framework is terrible and it is the significant inconvenience of the correspondence framework. We propose disarray correspondence framework utilizing 2X2 MIMO procedure which uses relationship defer move keying (CDSK) and BER execution is assessed over Rayleigh MIMO blurring channel. We are utilizing MIMO encoding procedure in light of the fact that the limit of information is relative to the number r of radio wire, if numerous reception apparatuses are connected to turmoil correspondence framework. So it is great way a1813pplying numerous - input and various yield (MIMO) to the Chaos correspondence framework and after that assess BER execution by applying disorder map. The interest for high information rate without obstruction is expanding definitely. So we are utilizing the idea of Orthogonal Frequency Division Multiplexing (OFDM) which gives high information rates just as substantially more data transfer capacity effectiveness when contrasted with other regulation proceduresTo deal with the unknown channel sparsity of the massive MIMO channel, this paper proposes a structured sparse adaptive coding sampling matching pursuit (SSA-CoSaMP) algorithm that utilizes the space–time common sparsity specific to massive MIMO channels and improves the algorithm from the perspective of dynamic sparsity adaptive and structural sparsity aspects. It has a unique feature of threshold-based iteration control, which in turn depends on the SNR level.

Keywords: MIMO,BER,OFDM,CDSK

1. INTRODUCTION

Digital image processing is the use of computer algorithms to Disorder correspondences are a use of Chaos theory which gives security in transmission of data. Confusion correspondence framework is increasingly secure now-a-days. In turmoil correspondence framework security is high because of its qualities, for example, non-intermittent, wide-band, non consistency and simple execution. The fundamental bit of leeway of Chaos correspondence framework is that it relies upon starting conditions. It is extremely delicate to starting conditions, in the event that underlying conditions are changed; at that point disorder sign is changed to various sign.

Except if the clients will know the underlying condition, the Chaos sign isn't correct and it will turn into difficult to anticipate its worth. That is the reason confusion correspondence framework is non-unsurprising and because of this reason the security level of disorder correspondence framework increments. In spite of the fact that confusion correspondence is secure correspondence and has numerous favourable circumstances, the framework likewise has a burden on Bit Error Rate (BER) execution. The BER execution of disorder correspondence framework is more regrettable. There are many research work done to improve the BER execution

The BER execution of disarray correspondence framework is improved by applying MIMO (Multi Input Multi Output) framework, in light of the fact that in turmoil correspondence framework the message sign is spread and has many transmitted images. MIMO method is utilized to transmit data sign utilizing different reception apparatuses by numerous ways. MIMO encoding method is utilized in light of the fact that the limit of information is corresponding to the quantity of radio wire, if numerous reception apparatuses are connected to Chaos correspondence framework.

At the beneficiary side the sign from various is added to get the first wanted yield. In this paper, we propose confusion correspondence framework utilizing 2X2 MIMO method which uses relationship defer move keying (CDSK) and BER execution is assessed over Rayleigh MIMO blurring channel. We are utilizing Alamouti STBC encoding of MIMO so as to improve the BER execution of the framework. Likewise, the Zero Forcing recognition calculation is utilized.

The high energy and spectrum efficiency of massive multiple-input multiple-output (MIMO) systems heavily build on the premise that the base stations (BS) obtain channel state information (CSI) with reasonable quality, which is generally estimated via pilot sequences However, in the uplink massive MIMO systems, the pilot overhead demanded should be proportional to the number of users and would be prohibitively large as the number of users increase. In the uplink multicell massive MIMO, this results in pilot contamination as the same pilot sequences have to be reused by neighbor cells to serve a large number of users Moreover, the pilot contamination is a major limiting factor to system performance Hence, the massive MIMO urgently needs efficient channel estimation scheme without producing pilot contamination and requiring too much pilot overhead. Based on the estimated CSI, the signals received at base stations are typically detected through linear methods with low complexity, such as zero-forcing and matched filter However, the performances of linear detector are typically far inferior to the optimal maximum likelihood (ML) detector whose computational complexity exponentially scales up with the signal constellation size and the number of antennas . Thus, the development of computationally efficient and reliable detector for massive MIMO also needs to be thoroughly addressed

In the past few years, several types of schemes have been exploited to mitigate or reduce the impact of pilot contamination in multicell massive MIMO systems.

(1) Semi-blind or blind approaches, such as the eigenvalue decomposition-based method with a short training sequence a semi-blind method without requiring the statistical information of channels. Another low-complexity semi-blind approach was proposed in which the received signal are firstly projected onto the subspace with minimal interference, then alternatively refined the channel estimation and detected the data symbols.

Applying the theory of large random matrices, proposed a blind pilot decontamination with subspace projection.

(2) Optimization design of non-orthogonal pilot signals, such as when training slots are not large enough to construct the orthogonal pilot signals, exploits a pilot design criterion and shows that the line packing on a complex Grassmannian manifold is the optimization scheme, which is based on minimal mean square error (MMSE) estimator. A generalized Welch-bound equality-based pilot signal design method is proposed in which has low correlation coefficients and ensures the network to satisfy the requirement of user capacity. For a given pilot length, proposes an alternating minimization-based pilot design algorithm.

(3) The precoding-based approaches, such as a MMSE-based precoding is exploited in to alleviate the impact of pilot contamination. A pilot contamination mitigation method along with zero-forcing precoding is proposed in, which can generate orthogonal pilot signals across neighboring cells through multiplying the Zadoff-Chu sequences element-wise with a specific orthogonal variable spreading factor code.Some significant efforts have been made to reduce the pilot overhead for massive MIMO systems, which can be divided into two broad categories.

(1) Low-rank channel covariance matrices based methods, such as the finite scattering environment and small angular spread result in high correlation of different paths between the user and the BS and low-rank channel covariance matrix. Through exploiting the correlation characteristic of channel vectors, the joint spatial division and multiplexing (JSDM) was proposed in which significantly reduced the overhead of downlink training and uplink feedback for frequency division duplexing (FDD) massive MIMO systems. When the number of pilot signals is no less than the rank of channel covariance matrix and the noise interference disappear, proves that the MMSE estimator can recovery channel vectors exactly.

(2) Compressed channel sensing method—exploiting the channel sparsity and applying the compressed sensing (CS) to reduce the overhead of CSI feedback has been investigated in A spare channel estimation method applying Gaussian-mixture Bayesian learning has been proposed in to estimate the whole channel parameters including the desired and interference links, which can mitigate pilot contamination and reduce pilot overhead, but every time, the approach just can estimate the channel response at one beam.

An iterative MIMO detector with relaxed ML constraints using sparse decomposition has been proposed to preserve a low computational cost even increase the signal size, but the method just suit to detect a vector In block fading systems, the detection target at the BS usually is a multiuser data frame, i.e., a two-dimensional (2D) signal block. To detect the 2D signals, the method in should run the decoding process many times or convert the 2D signal detection problem to a vector detection problem.

However, the converting method will substantially increase the required memory and processing load which would make it become non-competitive when applied to massive MIMO block fading systems.

II. OBJECTIVES

- In wireless mobile communication Inter-symbol Interference is the major problem.
- To reduce the interference and to improve the efficiency, we are using the concept of Orthogonal Frequency Division Multiplexing (OFDM) in this research.
- OFDM provides much higher data rates than conventional modulation techniques. In OFDM, multiple sub-carriers are used which are orthogonal from each other. Each channel is broken into multiple sub-carriers.
- The modulation occurs at Inverse Fast Fourier Transform (IFFT) of the transmitter.
- In this project, we focus on two suboptimal, in terms of Bit Error Rate (BER), yet computationally feasible, channel estimation algorithms for OFDM-based MultiUser (MU) MIMO communications.
- These algorithms are based on the LTE downlink frame structure, which is composed of a fundamental block of 12 subcarriers in a downlink slot, denoted as Physical Resource Block (PRB). In the first algorithm, referred to as Resource Block (RB), the channel is supposed to be constant

III. BLOCK DIAGRAM

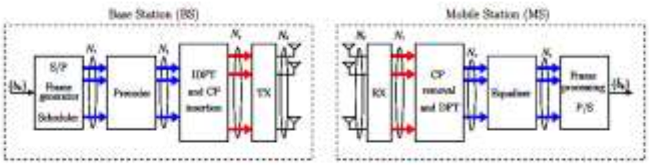

Fig III System model for the considered OFDM MU-MIMO downlink system

IV. Research Methodology/Planning of Work

In typical massive MIMO systems, each cell has a BS with large number of antennas, which allows the simultaneous utilization of resources (i.e., frequency band and/or time slots) by different users in the cell. In the following we will introduce the system model and explain the basic concepts of massive MIMO systems in the uplink and the downlink. For simplicity, we consider a single cell scenario with flat fading channels. The extension to frequency selective channels will be straightforward when modulations like OFDM and SC-FDP are employed. Without loss of generality, we assume a BS with M antennas and K single atenna users.

2 Orthogonality:

OFDM would allow more data transmission than FDM. Now the question is how OFDM prevent interference, while multiple sub-channels overlap with each other. Suppose we have three different signals to send over one shared channel simultaneously without interfering with each other. OFDM would combine them closely together in a way that they are orthogonal to each other.

Orthogonal means that two or more multiple objects act independently. In this case any neighbour signal in OFDM operate without dependence on or interference with one another. Now why orthogonality is necessary in OFDM? When one signal reaches highest point peak, the other two signal land at zero point. Therefore, orthogonal signals are multiplexed in a way that the peak of one signal occurs at null of the other neighbour signal.At the receiving end the de-multiplexer would separate them based on this orthogonal feature. OFDM would better utilise the available bandwidth, thus offering higher data transmission rate than FDM. Thus, using orthogonality property sub-channels can be overlapped without interference and hence the sub-channel can be placed as close as possible, therefore provides high spectral efficiency. Today, high rate data transfer is very vital for high speed communication. When high bit rate data is transmitted over radio mobile channel then the channel impulse response is spread over many symbol periods which leads to inter-symbol interference (ISI). In order to eliminate the effect of delay spread a narrow channel is chosen. OFDM technique is very efficient for eliminate ISI and also it is robust against narrow band interference or frequency selective fading. It also provides high spectral efficiency. The use of FFT technique foe the modulation and demodulation help to maintain the orthogonality of the sub-carrier.

MULTIPLE INPUT MULTIPLE OUTPUTS (MIMO):

It is an antenna technology used for wireless communication in which multiple antennas are used at both the source (transmitter) and the destination (receiver). The antennas at eachend of the communication circuit are combined to minimize errors and optimise data speed. Multiple antennas are used to reduce fading effect. It is also use to increases the efficiency of a network. It has the ability to multiply the capacity of antenna links which has made it an essential element of wireless communicationgeometry, changing material, noise, retouching or changes in the incident light. Thus, one can interpret an illuminant estimate as a low-level descriptor of the underlying image statistics. MIMO (Multiple Input Multiple Output) with OFDM (Orthogonal Frequency Division Multiplexing) is a key solution for the future generation of wireless communication system to achieve the exponential increase in the data rate . This is due to its simple implementation, high spectral efficiency, reliability and robustness against frequency-selective fading channels. Indeed, OFDM divides the entire frequency selective fading channel into many narrow flat parallel sub channels using overlapped orthogonal subcarriers which thereby reduces Inter-Symbol Interference (ISI) and increases the spectrum efficiency. Moreover, the reliability is increased by exploiting diversity of the MIMO system using Space Time Block

Code (STBC) without increasing the transmitted power However, the major challenge faced in MIMO-OFDM systems is the estimation of the Channel State Information (CSI) at the receiver side in order to recover the transmitted data correctly and maintain the expected performance of the system . The estimator precision directly affects the overall performance of MIMO-OFDM system. Several approaches for channel estimation have been proposed in the literature. Blind channel estimator, based on the second-order statistics of the received signals, shows good performances. However, this technique is limited to slow time varying channels as it requires a long data record and has high computational complexity. On the other hand, pilot aided channel estimators using pilot tones, that are known a prior to the receiver,

V. Conclusion

This paper starts with the important feature of space–time common sparsity specific to massive MIMO channels and improves the CoSaMP algorithm from the dynamic sparsity adaptive and structural aspects. The SSA-CoSaMP algorithm is proposed. The proposed algorithm not only optimizes the channel estimation performance but also reduces the pilot overhead, saving spectrum resources and energy consumption. The simulation result shows that the proposed algorithm has obvious performance gain compared with the traditional pilot-based channel estimation algorithms in both low SNR and smaller number of pilot conditions. In the wireless communication environment, the structural characteristics are not only in the actual delay multipath domain but also in the virtual angle delay domain. Therefore, the next research work is mainly for massive MIMO antenna arrays where the problem of sparse structuring in the virtual angle domain enables the structural improvement scheme to be applied in the virtual angle domain, deeply exploring the scope of structured use and improving the applicability of the scheme..

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