OFDM-based Massive MIMO Channel Estimation using Gaussian Mixture Learning and Compressed Sensing Methods

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Abstract**:** ***Massive MIMO-OFDM system is proved to be an effective and most sustainable technology to forthcoming applications of 5G wireless communications. It furnished significant gains that facilitate a higher number of user connections at high data rates with improved latency and reliability. To achieve accurate channel knowledge, lessen pilot overhead is necessary. To resolve this problem, one of the favorite approaches is compressed sensing. Sparse channel estimation develops the essential sparsity between the communicating channels that can be improved by the channel estimation efficacy with lower pilot overhead. To achieve this, non-zero vector distribution can be taking into consideration the Gaussian mixture accordingly, learn their characteristics towards the expectation-maximization procedure. The results of simulation have proved the performance of proposed estimation approach of channel keeping with minimum pilot overhead and developed exceptional symbol error rate (SER) performance of the system.***

Index Terms**:*****Massive MIMO-OFDM,Gaussian Mixture, Approximate message passing, Channel estimation Compressed sensing.***

I. INTRODUCTION

The Massive MIMO-OFDM is preeminent and supportive technology to 5G wireless applications that has to maintain excellent data rate and accuracy [1]. To achieve these eminent properties, knowledge of channel information is a most challenging issue in massive MIMO-OFDM systems, therefore, it is necessary to apply relevant estimation techniques to channels between all transmitting and receiving antennas accordingly. In this connection, by the use of proper training sequence design one can acquire accurate channel estimation [6,7]. However, with the help of least square (LS) or minimum mean square error (MMSE) methods to estimate the channel, they are non-supportive for adequate performance due to high computational complexity.

In general, communicating channels are sparse inherently; however, the majority of channels viewed as zero coefficients at channel impulse response (CIR). With a focus on channel sparsity, we implemented the compressed sensing-Aided (CS-Aided) method to characterize the channel properties of the massive MIMO-OFDM model [1]. The key advantage of the proposed approach needs fewer pilots than conventional methods. Many of the researches focused on different Greedy algorithms and Bayesian compressed sensing (BCS) methods [16] which are used to determine the channel estimation onto the concentrated system model. Nonetheless, channel sparsity level is to point out as prior information at the receiving side.

The sparsity adaptive matching pursuit (SAMP) provides high performance at a wide range of practical applications without channel sparsity. However, there is inconsistency between convergence speed and recovery accuracy because SAMP has maintained a constant step size [2, 3]. OFDM is one of the modulating systems that provide to mitigate interference and crosstalk resulting from the conversion of the serial data stream into parallel data stream at different frequencies. OFDM massive MIMO compressed sensing based channel estimation is set as sparse and dense vectors. These vectors are a combination of zero and nonzero vectors respectively. On the perfect sparse recovery, the sparse signal is reconstructed through the support of the LS technique [12].

The expectation-maximization (EM) steps are established to accomplish quantities of estimation following a Gaussian mixture model. Furthermore, the generalized approximate message passing (GAMP) which is an active algorithm in i.i.d distributed random signal [14] is exploiting to develop the expectation step and also mitigate computational complexity. The fast iterative truncation algorithm (FITRA) which is for sparse representation that was elaborated in [8], which found that it has a significant possible convergence rate, provided a regularization parameter to achieve the MUI cancellation and also standardize the functioning of the algorithm. In current work, we established and compared with a renewed compressed sensing aided over Gaussian mixture algorithms for downlink massive MIMO-OFDM systems with a reference of ZF pre-coding technique respectively. To estimate the error performance, the truncated and Bernoulli Gaussian mixture procedures are considered and entrusted to the unknown signal.

Simulated results found that the suggested algorithms provide a substantial improvement in terms of computational difficulties. The remainder part of this work is partitioned as per the following. Second Section discusses downlink and estimation models of noise. The third section covers training sequence design and the principle of estimation to existing technique, the fourth section discusses OMP and Bayesian approaches, fifth section practical issues and finally sixth section concludes.

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