AN IMPLEMENTATION OF ADAPTIVE CLASSIFICATION INVESTIGATION FOR CHANNEL ESTIMATION IN MU-MIMO

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ABSTRACT:

A large multi-user scalable multi-input multiple-output (MIMO-MU) Wireless Communications systems, reference to the base station (BS) is made is equipped with a very large In LTE-Advanced (LTE-A) demodulation reference symbols are hired for pilot aided channel estimation to perform coherent detection. Since these reference symbols are allotted at the identical time-frequency positions for all customers in Multi-User MIMO (MU-MIMO) operation or for all spatial layers in Single-User MIMO (SU-MIMO), they're designed to be code-domain orthogonal for you to be separable on the receiver. This orthogonality is received by way of cyclically shifting a reference sign base collection, where the precise cyclic shift values are signaled to each person. In this paintings we show formal equivalence of SU-MIMO and MU-MIMO for LTE-A uplink within the context of channel estimation. We propose a general compliant mapping that assigns cyclic shifts to customers such that SU-MIMO estimation methods are relevant additionally for MU-MIMO transmissions. Further we show the trade-off among the quantity of active users and the channel's frequency selectivity in MU-MIMO operation due to the residual channel estimation errors

INTRODUCTION:

In radio, multiple-input and multiple-output, or MIMO is a method for multiplying the capacity of a radio link using multiple transmit and receive antennas to exploit multipath propagation.[1] MIMO has become an essential element of wireless communication standards including IEEE 802.11n (Wi-Fi), IEEE 802.11ac (Wi-Fi), HSPA+ (3G), WiMAX (4G), and Long Term Evolution (LTE 4G). More recently, MIMO has been applied to power-line communication for 3-wire installations as part of ITU G.hn standard and HomePlug AV2 specification.[2][3] At one time, in wireless the term "MIMO" referred to the use of multiple antennas at the transmitter and the receiver. In modern usage, "MIMO" specifically refers to a practical technique for sending and receiving more than one data signal simultaneously over the same radio channel by exploiting multipath propagation. MIMO is fundamentally different from smart antenna techniques developed to enhance the performance of a single data signal, such as beamforming and diversityThe multiple-input multiple-output

(MIMO) wireless systems It has been extensively studied in recent years, and applied to many wireless Standards due to the fact that the channel capacity and reliability [6] is improved. In For a single user MIMO (SU-MIMO) system data and high-speed link from point to point The transmission can be supported by multiple space while providing space diversity gains. In addition, SU-MIMO systems multiply the gains disappear when The signal strength is low in relation to interference and noise, or in the publication With a dominant line of sight environments or a few distractions. Practical Restrictions on the size of the terminals also limit the number of antennas that can be used Thus doubling the gain [13]. However, most communications Dealing with multiple users sharing the same radio resources in systems It is to provide multiple mobile terminals by a base station. Utilization MIMO is considering large-scale technology as a potential technology The fifth generation (5G) wireless systems due to the high levels of efficiency / amount of spectrum, and increasing the reliability and energy efficiency [8]. MU-MIMO Wireless system has gained a lot of attention, as it canA significant increase in data transfer and achieve higher speed increase diversity gains. Consider multi-stream each user of MU-MIMO system, the base station (BS) Communicate with multiple users on the same frequency ranges and time, each Receives multiple current [4] users. Tin. 1 illustrates a typical multi-user MIMO (MUMIMO) Contact environment in which multiple mobile stations (MS) or It is to provide users with all the multiple antennas for a title and multigradeAntennas in the communication system. Given the diversity of a multi-user, and The performance of MU-MIMO systems are generally less sensitive to publish Environment than it was in the case of MIMO point-to-point [6]. To achieve a high system Power, energy and spectral efficiency, user equipment (UE) is communicating Through orthogonal channels. Deletion of the intervention can be achieved by using descending strong precoding techniques.

MIMO can be sub-divided into three main categories: precoding, spatial multiplexing (SM), and diversity coding.

Precoding is multi-stream beamforming, in the narrowest definition. In more general terms, it is considered to be all spatial processing that occurs at the transmitter. In (single-stream) beamforming, the same signal is emitted from each of the transmit antennas with appropriate phase and gain weighting such that the signal power is maximized at the receiver input. The benefits of beamforming are to increase the received signal gain – by making signals emitted from different antennas add up constructively – and to reduce the multipath fading effect. In line-of-sight propagation, beamforming results in a well-defined directional pattern. However, conventional beams are not a good analogy in cellular networks, which are mainly characterized by multipath propagation. When the receiver has multiple antennas, the transmit beamforming cannot simultaneously maximize the signal level at all of the receive antennas, and precoding with multiple streams is often beneficial. Note that precoding requires knowledge of channel state information (CSI) at the transmitter and the receiver.

Spatial multiplexing requires MIMO antenna configuration. In spatial multiplexing,[33][34] a high-rate signal is split into multiple lower-rate streams and each stream is transmitted from a different transmit antenna in the same frequency channel. If these signals arrive at the receiver antenna array with sufficiently different spatial signatures and the receiver has accurate CSI, it can separate these streams into (almost) parallel channels. Spatial multiplexing is a very powerful technique for increasing channel capacity at higher signal-to-noise ratios (SNR). The maximum number of spatial streams is limited by the lesser of the number of antennas at the transmitter or receiver. Spatial multiplexing can be used without CSI at the transmitter, but can be combined with precoding if CSI is available. Spatial multiplexing can also be used for simultaneous transmission to multiple receivers, known as space-division multiple access or multi-user MIMO, in which case CSI is required at the transmitter.[35] The scheduling of receivers with different spatial signatures allows good separability.

Diversity coding techniques are used when there is no channel knowledge at the transmitter. In diversity methods, a single stream (unlike multiple streams in spatial multiplexing) is transmitted, but the signal is coded using techniques called space-time coding. The signal is emitted from each of the transmit antennas with full or near orthogonal coding. Diversity coding exploits the independent fading in the multiple antenna links to enhance signal diversity. Because there is no channel knowledge, there is no beamforming or array gain from diversity coding. Diversity coding can be combined with spatial multiplexing when some channel knowledge is available at the transmitter.

IMPLEMENTATION:

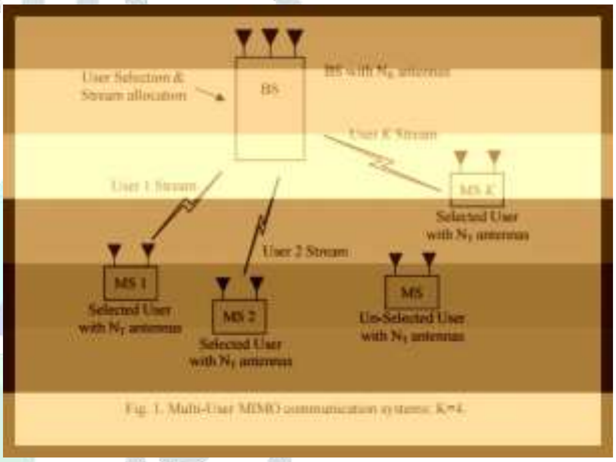


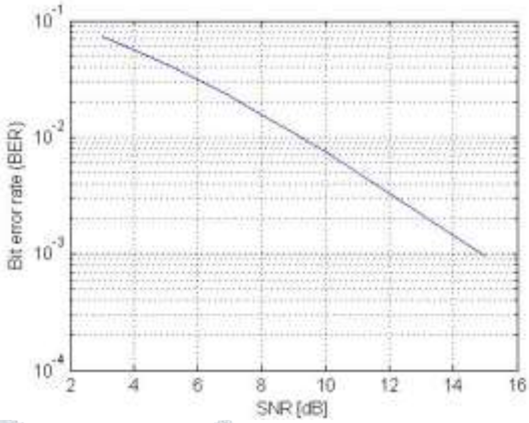
Fig. 1. Multi-User MIMO communication systems: K=4.

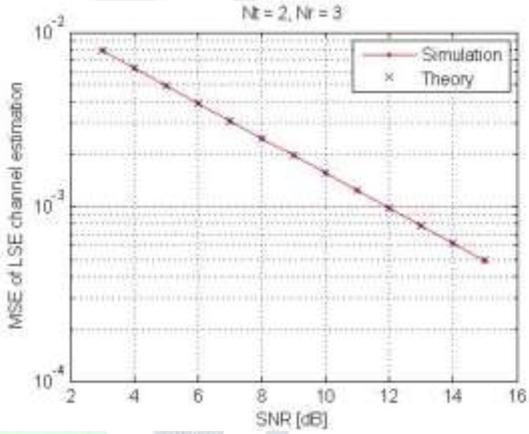
The LTE-A uplink employs Single-Carrier Frequency Division Multiplexing (SC-FDM) as physical layer access scheme, which is basically Discrete Fourier Transform (DFT) spread OFDM. This means that modulated symbols of each spatial transmission layer are DFT transformed prior to the MIMO OFDM processing as explained in [12]. Similarly, received symbols are transformed by an Inverse Discrete Fourier Transform (IDFT). Due to this layer-wise spreading, a single carrier like physical layer scheme is obtained, in the sense that each symbol is spread over all subcarriers for transmission. For the purpose of channel estimation however, the system model corresponds to OFDM, since the pilot symbols are multiplexed after the DFT spreading and the channel estimation takes place prior to de-spreading [12]. We consider a perfectly synchronized OFDM transmission with k ∈ {1,...,NSC} scheduled subcarriers and n ∈ {1,..., 7} OFDM symbols per slot, corresponding to normal Cyclic Prefix (CP) length operation of LTE-A. We assume the wireless channel to be constant for the duration of an OFDM symbol and the CP length to be longer than the channel's delay spread such that no inter-symbol or inter-carrier interference occurs

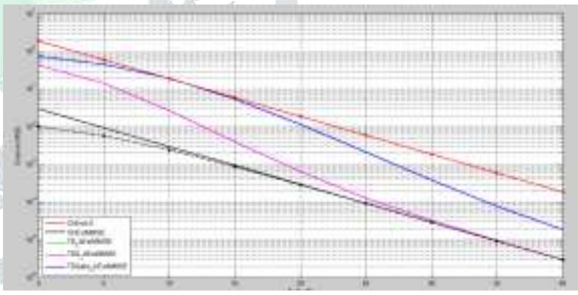
promised to give productivity Over the 4G systems. He gave his idea of using the huge MIMO systems for increased performance in communications systems. Huge MIMO systems with multiple antennas placed in a hundred improvement BA The spectral efficiency considerably. Effective distribution of a huge scheme MIMO is an antenna design intensive. Furthermore, this technique showed DPC Better performance compared to BD and THP. In [8], and the proposed low complexity detection algorithms widely MIMO spatial modulation (SM-MIMO) systems. NOTE interesting The results of the simulation are that the SM-MIMO MIMO mass exceed several DBS for the same spectral efficiency. Similar performance improvements offered in Saleh SM-MIMO in a frequency selective fading. SNR advantage SMMIMO Attributed to the massive MIMO for the following reasons: (a) due to the little spatial index, the SM-MIMO system can use less frequently on the square Modulation (QAM) alphabet compared to what it was in the huge MIMO to achieve The same spectral efficiency, and (b) for the same spectral efficiency and size QAM, You will need more than sheer MIMO spatial streams for each user who causes an increase spatial intervention. In [9], and the problem of pollution in various MIMO pilot huge cellsIt has been studied systems under correlated channels, and simulate the MATLAB program. Simulation results show that the performance of a massive MIMO systems worsen when the channels are connected. When Large enough correlation coefficient channels, and a tremendous performance Too bad for MIMO systems work. When the channel correlation coefficient Smaller than a certain value, and high performance MIMO It can effectively improve with the increased number of BS antennas. While the correlation coefficient exceeds a certain value channel, huge performance MIMO systems is improved by increasing slowly The number of BS antennas. In [13], the linear performance before coding for MIMO downlink very large He studied channels. They show that the channels used, studied at residentialareaThe deployment environment can not correlated using a large reasonable antenna arrays at the base station. With linear precoding, and rates up 98% of the capacity of DPC two users BS antenna and antennas 20 Check. These have shown that, even in environments published realistic and With a relatively limited number of antennas, and the benefits of a large number of It can be observed antennas used in the BS. In [14], and we have seen that the MU-MIMO limited reactions, the remaining system (ZFBF) transfer a multi-user intervention created even beamforming ZF Reducing performance. When each user is not aware of other users Channels, and improve performance through the exact channel quality index (CQI) Estimate, receive beamformer and channel selection expression is completely Challenge. imulation results that can improve performance demonstrated It can be obtained by designing both the reception beamformercodeword channel for Improve SINR / CQI. In addition, the BS can further improve performance through CQI adjusted each user based on channel feedback real coscheduledUsers..

SIMULATION RESULTS:

The results have shown the system level, even with limited Reactions operating systems MU-MIMO, you can achieve a multi-user MIMO gains to be Improvement. In [15], taking into account the standard THP algorithm descending MUMIMO It does not provide the flexibility to distribute advanced user, and THP Amendment The proposed algorithm that accepts arbitrary linear precoder effectiveness. The The authors studied the special case of THP (ZF-THP) with arbitrary user, forcing zero Distribution of power and the distribution of power derived optimal user to maximize weighted average number of users. In our work, the performance of linear precoding techniques taught two Amendment schemes (QPSK and QAM 16) for beamforming and large scale MUMIMO The study of systems through simulation. We consider the environment from a single cell That a degree of the antenna with a wide range serves a number of multiple antennas Users at the same time







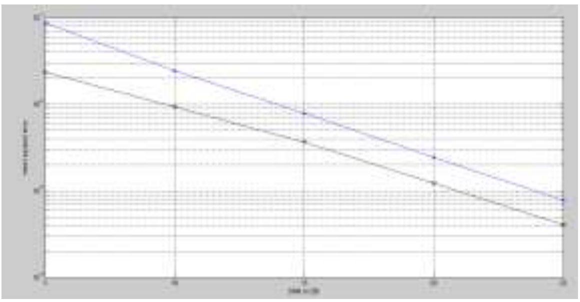


Fig: Performance analysis of spectral efficiency improvement for large scale MU-MIMO system

CONCLUSION:

In this work we showed that the problem of channel estimation is equivalent for SU-MIMO and MU-MIMO in LTE-A uplink. In both cases, reference symbols originating from different spatial layers or users overlap entirely in time and frequency, according to their standardized allocation. Therefore the DMRS code domain orthogonality needs to be exploited to separate MIMO channels at the receiver. We showed that orthogonality can be ensured in between spatial layers of a single users as well as in between multiple users transmitting simultaneously by means of signaling. We proposed a standard compliant mapping function for signaling the CSF to users in MU-MIMO such that reference symbols of users are not only orthogonal, but also SU-MIMO estimation schemes are directly applicable. Since orthogonality is in general destroyed during transmission over a frequency selective channel, the channels RMS delay spread leads to a residual channel estimation error for correlation based estimation. We further analyzed the trade-off between the channel's frequency selectivity and the number of active MU-MIMO users. On a highly frequency selective channel only few users can be served with correlation based estimation without any prior channel statistics..

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