A Review on Transmit Antenna Selection for Massive MIMO Systems

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Abstract**—** According to previous approaches consider the issue of transmit antenna choice for massive multiple-input multiple-output systems by maximizing the determinant modulus of the chosen channel matrix. In view of the most extreme volume submatrix discovering technique, a real-time antenna-by-antenna iterative swapping enhancement (RAISE) transmit antenna choice calculation with low memory cost and low computational many-sided quality. The merging of the calculation is demonstrated and the execution of it is assessed by means of numerical reproductions. Outcomes demonstrate that, contrasted with the conventional reception apparatus choice calculations, RAISE can accomplish close ideal limit execution while the computational intricacy and the memory expense are essentially lessened.

Keywords**—**Massive Multiple-Input Multiple-Output MIMO, Antenna Selection, Low many-sided quality.

I. INTRODUCTION

MIMO stands for Multiple Input and Multiple Output that means we use multiple antennas at the transmitter and receiver, by doing so we are increasing the channel capacity as we can accommodate more number of subscribers in wireless communication system [3].

Figure 1: MIMO.

If increase the number of antenna we are increasing the degree of freedom of channel, improving its performance or flexibility and even the gain also improves. The price for MIMO is more because of the hardware used, its complexity and energy consumption for signal processing at both ends. In a point-to-point communication complexity at the receiver is more important but in multiuser communication the complexity at the transmitter along with the receiver is also important because advances coding schemes are used for transmitting data simultaneously to more than one user and maintaining the interference. One more challenge to MIMO system is that we require physical space to accommodate the antennas including the rent. There are four basic types of MIMO system based on the number of transmitter and receiver antennas used.

A. MIMO-SISO (Single Input Single Output)

The advantage of SISO system is that it is simple and requires less processing. But it is limited in performance due to interference and fading [9].

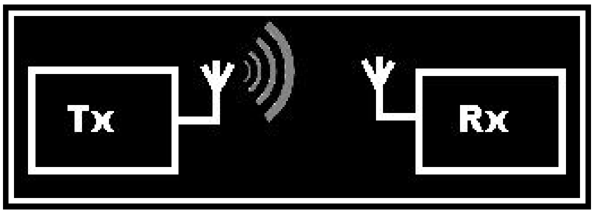

Figure 2: SISO.

B. MIMO-SIMO (Single Input Multiple Output)

This system is relatively easy to implement, but as there is multiple antennas at the receiver we require some processing at the receiver [9].

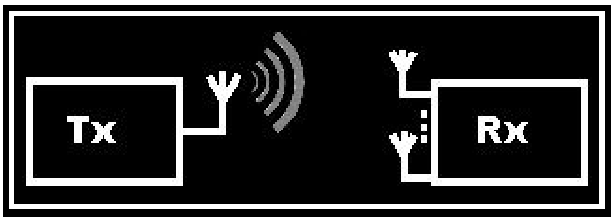

Figure 3: SIMO.

C. MIMO-MISO (Single Input Multiple Output)

The advantage here is that the processing is at the transmitter than at the receiver. The receiver can be handheld device with limited power as the processing is reduced the life time of battery is improved [9].

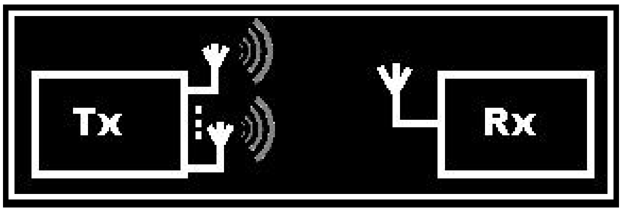

Figure 4: MISO.

D. MIMO (Multiple Input Multiple Output)

As we have multiple antennas at the receiver and transmitter we have processing at both the ends but we are increasing the number of user, the data rate is increased and good quality of service [9].

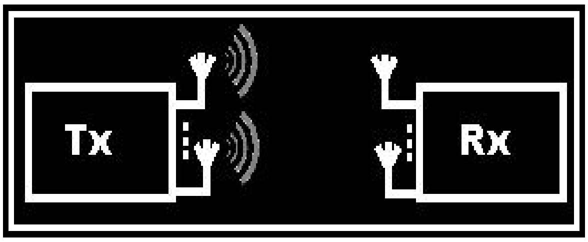

Figure 5: MIMO.

In Massive MIMO or larger MIMO there are going to be more than 100 antennas. But not all the antennas will work at the same time; a limited number of antennas will be operating at a time because of limitation to acquire channel state information. Massive MIMO technology can be made possible by combining the conventional TDMA, FDMA and OFDM multiplexing technology. Future prediction is that the Massive MIMO technology will use very low power in the order of milliwatts. The major challenges are multiuser multiplexing gains, error in channel state information and interference. The power consumption at the base stations is a growing concern. Massive MIMO system will be designed in such a way that it will be robust to the failure of the antenna [1].

II. LITERATURE REVIEW

MASSIVE multiple-input multiple-output (MIMO) systems have as of late gotten much consideration because of their emotional ability to give higher date rates, improved connection unwavering quality, what's more, critical force funds for future past 4G frameworks [1,2]. With hundreds on the other hand a significantly bigger number of low-influence receiving wires being utilized at base station (BS), rich dispersing environment that once restrains the job of ordinary MIMO system is no more an issue since enough autonomous channel can unquestionably be found in such a colossal channel space [2]. In any case, the sign handling and equipment cost turn into an overwhelming trouble with the expanding number of radio wires. With a specific end goal to decrease the equipment cost and computational many-sided quality, while holding a large portion of the differences or multiplexing advantages of all radio wires, transmit reception apparatus choice method can be utilized to utilize a littler number of RF modules than the quantity of every single accessible reception apparatus [2,4]. It is realized that the ideal reception apparatus subset can be found through comprehensive looking. In any case, the computational many-sided quality of comprehensive hunt becomes exponentially with the all out number of the accessible radio wires [12, 13]. Hence, comprehensive hunt is unrealistic because of the enormous number of radio wires utilized in monstrous MIMO frameworks. Heaps of existing low many-sided quality reception apparatus determination calculations have been proposed to discover an imperfect arrangement in routine MIMO frameworks [5–8]. Notwithstanding, the calculations in these works are not suitable for continuous execution of transmit radio wire determination in gigantic MIMO frameworks. For cases, the execution of the calculation in [5] is restricted by its 'neighborhood seek' trademark and this calculation additionally might experience the ill effects of extensive limit misfortune in more awful cases. A promising path, proposed in [7] and [8], includes a considerable measure of framework operation and requires countless, which is likewise illogical for realtime usage. Ongoing execution raises some new difficulties, specifically, it requires arrangement techniques that are to a great degree dependable and finished in an anticipated sum of time and memory [10].

As of late, reception apparatus determination strategy in enormous MIMO frameworks has been examined in [3] furthermore, [4]. In any case, [3] just centered around the frameworks with single-receiving wire clients and the number of accessible reception apparatuses was not all that substantial as "enormous" in [4]. Subsequently, the radio wire choice for enormous MIMO frameworks has not been adequately explored and it is trying to devise low multifaceted nature and low memory cost radio wire determination calculation for gigantic MIMO systems.

According to previous approaches focus on designing a low computational complexity and low memory cost transmit antenna selection algorithm for real-time implementation in massive MIMO systems through an iterative antenna-by-antenna swapping enhancement procedure. The algorithm is based on solving a determinant modulus maximization problem by using maximum-volume submatrix finding method [11] rather than directly solving the complicated capacity maximization problem. Theoretical analysis and simulation results reveal that the proposed algorithm is sure to converge (the speed is fast) and can significantly reduce the computational complexity and memory requirement while achieving near optimal capacity performance.

A MIMO system consists of a number of transmitter and receiver antennas and a fading channel through which the data will be sent. Let us consider we have t number of transmitter antennas and r number of receiver antenna i.e. we form a matrix for transmitter and receiver antennas having t number of rows in transition matrix similarly r number of rows in receiver matrix. The basic equation for MIMO system is given by

$$Y = H.X + W$$

Where, *Y= r x 1 Receiver matrix*
H= r x t Channel matrix
X= t x 1 Transition matrix
W= Noise

In a point-to-point communication complexity at the receiver is more important but in multiuser communication the complexity the transmitter is also important because advances coding schemes are used for transmitting data simultaneously to more than one user and maintaining the interference. One more challenge to MIMO system is that we require physical space to accommodate the antennas including the rent. In Massive MIMO or larger MIMO there are going to be more than 100 antennas. But not all the antennas will work at the same time; a limited number of antennas will be operating at a time because of limitation to acquire channel state information. Massive MIMO technology can be made possible by combining the conventional TDMA, FDMA and OFDM multiplexing technology. Future prediction is that the Massive MIMO technology will use very low power in the order of milliwatts [4].

III. CONCLUSION

According to previous contemplated the issue of transmit radio wire determination for huge MIMO systems or frameworks. By changing the limit expansion issue to the determinant modulus expansion issue, it introduced a real-time iterative transmit antenna selection algorithm (i.e., RAISE) whose merging has been demonstrated. On account of the antenna by radio wire iterative swapping strategy, the computational many-sided quality and the memory cost of RAISE are fundamentally diminished contrasted with customary calculations. Recreation results demonstrated that RAISE can accomplish close ideal execution even with a little emphasis number. Accordingly, the introduced algorithm or calculation is of practical significance for massive MIMO frameworks or systems.

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