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Mimo Channel Efficiency in Wireless Sensor Networks

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Abstract:
Wireless sensor network (abbreviated as **WSN**) is collection or a group of spatially distributed sensor devices for observing and recording the conditions of the atmosphere and organizing the collected data at a central location. Multiple-input Multiple-outputhas antennas to transmit waves and Massive MIMO is similar like MIMO except the fact that antennas are bound together to transmit and receive better results through better spectrum efficiency in here. Usually Massive MIMO networks utilise beam forming technology which is a technology that enables the targeted use of spectrum. These MIMO's are applicable to ad-hoc networks where sensors come into usage. Channel specification in terms of allocations are easily met in most cases but channel efficiency is to be taken care of in future implementations.

Keywords: *MIMO, Channel, Bandwidth, Bit-error-rate, AoA, AoD, BER.*

I. Introduction

With massive MIMO on using just one channel, peak speeds of more than 300 megabits per second are reached and when three carrier aggregation is carried out on top of this massive MIMO antenna we could get approximately get gigabit per second capability.

MIMO is a wireless network that transmits and receives more than one data signal at once over the same considered channel. Massive MIMO networks generally use beam forming technology which is nothing but activating the targeted use of spectrum. MIMO definitely has its remarkable application in 5G, which technology is being developed for getting it into use for the days to come .Hybrid pre recoding that has been previously proposed is hoped to be energy efficient and also reduce power consumption where MIMO systems in terms of m Wave is applied practically. In practical application of MIMO, there are hundreds of antennas which constitutes of much lesser number of radio frequency chains. Hybrid precoding, analog and digital, demands accurate channel information. But since the digital baseband cannot be accessed directly by all antennas as it has smaller number of RF chains, it is difficult to obtain accurate estimation of the MIMO's dimension.

II. Existing System

The methodology of iteratively re-weighted(IR) is commonly existent method to resolve optimization issues with objective functions of the type *p*-norm:a step by step method in which each step involves unravelling a weighted problem of the given considered form. IR is used to find the maximum probability in estimating the linear model for channel which is most suitable, and to find an M-estimator which is used to justify the influence of

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outlying data in a normally-distributed data set. Minimizing the least absolute errors rather than the least square errors as used before is applicable to the M-estimator. Weiszfeld's algorithm is used here even when it is not a linear regression problem. That could be accounted for approximation purposes, whose function is neutral in giving the sum of distances from the samples.

One of the advantages of IR(LS) in linear programming and optimization programming is that it can be used with famous algorithms such as Gauss–Newton and Levenberg–Marquardt (numerical).

III. Literature Survey

S.No	TITLE	AUTHOR	PROPOSAL
1.	Super-Resolution Channel Estimation for MmWave Massive MIMO with Hybrid Precoding.	Chen Hu, Linglong Dai, Talha Mir, Zhen Gao	IR(Iteratively Reweighted) and SVD
2.	Spatially Sparse Precoding in Millimeter Wave MIMO Systems	Omar El Ayach, Sridhar Rajagopal, Shadi Abu-Surra, Zhouyue Pi	Precoding
3.	Energy-Efficient Hybrid Analog and Digital Precoding for mmWave MIMO Systems with Large Antenna Arrays.	XinyuGao, LinglongDai, Shuangfeng Han, Chih-Lin I	SIC-based hybrid precoding
4.	Construction And Validation Of Analytical Wireless MIMO Channel Models Based On Channel Measurement Data	Alexander A.Kalachikov	Kronecker and Weichselberger models
5.	Performance Evaluation Of The Detection Algorithms For MIMO Spatial Multiplexing Based On Analytical Wireless MIMO Channel Models	Alexander A.Kalachikov	CDF of minimum and maximum values of the channel.

[Literature Survey 1]
Channel estimation is a found to be a challenge for millimeterwave (mmWave) in massive MIMO for hybrid precodingas the number of radio frequency (RF) chains is much smaller than that of antennas which transmit in mmWave.Channel estimation

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schemes suffer from severe resolution loss when channel angle is quantized.

Iterative reweight (IR)-based estimation scheme is suggested to improve the channel estimation accuracy. The objective of the paper is achieved iteratively which is the optimal result and we finally get channel estimation details. A parameter called weight parameter is used for controlling the data fitting error. To reduce the complexity of the proposal, a singular value decomposition (SVD)-based preconditioning is applied.

[Literature Survey 2]
It is told that mm Wave signals have more path loss than microwave signals. Microwave signals are widely used in many wireless applications. Systems that use Mm Wave control larger antenna arrays done by the decreasing wavelength. It reduces path loss as it gives beam forming gain. Precoding is nothing but beam forming with multiple data streams improves mm Wave spectral efficiency.

Beam forming in precoding is done digitally on a baseband in multi-antenna systems. However the pricey hardware limitation restricts the achievable output that can be applied practically by mm Wave transceivers. Using the principle of basis pursuit, the algorithms that generate precise optimal result are used to implement proposal in a low-cost RF hardware.

[Literature Survey 3]
Millimeter wave MIMO is said to favour hybrid precoding as it uses a minor number of RF chains. They decrease the energy consumption linked with signal components like analog-to-digital components. Hybrid precoding techniques provide solutions for a fully-connected design(Planned and rigid) which requires a large number of phase shifters(on both sides-analog and digital).

Energy-efficiency with hybrid precoding is focused upon. Successive interference cancellation(also known as SIC) hybrid precoding is projected which supposedly gives an almost-optimal performance and comparatively lesser complexity. SIC based hybrid precoding along with another common algorithm is said to remove the use of singular value decomposition (SVD) and matrix inversion method.

[REFERENCE 6]
Orthogonal frequency division multiplexing(also known as OFDM) is usually applied in MIMO to widely attain good spectral efficiency rate. The main plot thus evolves around OFDM. The main challenge is to to make the OFDM MIMO in huge scale systems, function in high-dimensional channel which has been estimated already, such as in mobile channels which supports multipath.
Time-frequency training OFDM (TFT-OFDM) for large scale MIMO systems is suggested. Whereas at the receiver side, the time-frequency joint channel estimation method is suggested to precisely track the variation in channel thus successfully having a greater connection. The BER performance obtained is found to be applicable to channels whose capacity is similar to mobiles.

[REFERENCE 9]
Two major challenges taken here is to provide backhaul to the batteries and finding effective techniques to uphold higher frequency channel bands for this backhaul process. Use of outdoor space as a condition, m wave communications for backhaul networking and also for mobile access is proposed. To overcome the outdoor surroundings' disadvantages found during propagation, using large arrays could be found effective.
However the systems which use large arrays require narrow beams which might result in environmental concerns which might arise to damages. So instead, an efficient beam alignment technique is said to be carried out in this situation. Generally, it is impossible to use huge arrays without jeopardizing a efficiency loss from various misplacement factors. A new alignment technique is proposed along with the performance of it is analysed and compared with various new alignments here.

IV. Objectives

- *Signal Generation*

Energy Beam Generation is to be done using the application which generates wave beam used as sampling for project execution.

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- Spatial modulation:

It focuses to derive performance of Spatial Modulation under different channel fading conditions, number of transmit-antennas to be required and power allocation methods to efficiently manage power.

- Apply OFDM:

Orthogonal frequency-division multiplexing (also known as OFDM) is done to split several separate band channels which can be as narrow as possible at different frequencies given to reduce interference and crosstalk.

- Analyze the precoding output:

Analyze the output obtained from the OFDM, which gives different segregated data such as noise, inference and required data output.

- *Maximum likelihood* estimation:

Obtains the max value of the optimized estimation hunch from which the maximum value that can be applied for best quality is obtained. Calculated and specified by probability density function(pdf), log pdf, or negative log likelihood functions.

- Spatio-Temporal Context:

Context in which learning occurs that reflects both the space in which the data obtained is applied and the time sequence of the learning event is recorded.

V. Conclusion

The way a channel estimation is decided is very limited and cannot be depended upon fully as it has not be fully developed. It was mainly assessed to obtain suitable angle position which is done by amplitude comparison with the respective beam values. But using the angular channel sparcity, the on-grid compressive sensing based methods could be used to estimate the channel characteristic with reduced training time. However all these results were given with the assumption that the angle of arrivals or departures(AoAs/AoDs) lie in different discrete points in the angle domain graph (on-grid). But whereas in reality the AoAs and AoDslie in a continuously distributed(off grid) in practical graph. Specifically, we iteratively adjust and find the approximations of AoAs/AoDs, which decreases the data fitting error in a graph. The weight that controls the adjustment between the sparsity and the data fitting error is iteratively corrected to avoid the data boundary from becoming too large or too small. The estimated AoAs and AoDs are moved from its initial angle towards the off-grid, thus making the proposed scheme achieve the super effective channel assessment. The proposed solution can obtain feasible solution.A combination of hybrid precoding to reduce energy consumption and SDM(Spatial Durbin Model) for better channel maximum usage can be tested out.

VI. References

1. "Broadband MIMO-OFDM Wireless Communications" By Gordon L. Stüber, , John R. Barry, Steve W. Mclaughlin, Ye (Geoffrey) Li, Mary Ann Ingram.
2. "Recent advances and future challenges for massive MIMO channel measurements and models" By Cheng-Xiang WANG, Shangbin WU, Lu BAI, Xiaohu YOU, Jing WANG.
3. Super-Resolution Channel Estimation for Mm Wave Massive MIMO with Hybrid Precoding" by Chen Hu, Linglong Dai, Talha Mir, Zhen Gao.
4. "Spatially Sparse Precoding in Millimeter Wave MIMO Systems" by Omar El Ayach, Sridhar Rajagopal, Shadi Abu-Surra, Zhouyue Pi.
5. "Energy-Efficient Hybrid Analog and Digital Precoding for mmWave MIMO Systems with Large Antenna Arrays " by XinyuGao, Linglong Dai, Shuangfeng Han, Chih-Lin I, Senior Member, IEEE.
6. "Spectrally Efficient Time-Frequency Training OFDM for Mobile Large-Scale MIMO Systems" by Linglong Dai, Zhaocheng Wang.
7. "Millimeter wave beamforming for wireless backhaul and access in small cell networks" by SooyoungHur, Taejoon Kim, David J. Love, James V. Krogmeier.
8. Energy-Efficient Hybrid Analog and Digital Precoding for mmWave MIMO Systems with

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Large Antenna Arrays By XinyuGao, Student Member, IEEE, Linglong Dai, Senior Member, IEEE, Shuangfeng Han, Member, IEEE, Chih-Lin I, Senior Member, IEEE.

9. Millimeter Wave Beamforming for Wireless Backhaul and Access in Small Cell Networks By SooyoungHur, Student Member, IEEE, Taejoon Kim, James V. Krogmeier, Member, IEEE, Timothy A. Thomas, Member, IEEE, and AmitavaGhosh, Senior Member, IEEE.
10. Spatially Sparse Precoding in Millimeter Wave MIMO Systems By Shadi Abu-Surra, Zhouyue Pi, and Robert W. Heath, Jr.