A Novel High Resolution Algorithm for Mobile Detection & Capacity Implementation

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Abstract

In recent years Smart Antenna is a fast rising areas of communication systems. Smart antennas are especially aggressive of their applications in related fields such as Fourth Generation (4G) technologies and these are best suitable for multi carrier modulations. In our project contains main utilize of smart antennas in Mobile communication that upgrades the capability of the mobile devices as well as enhanced the cellular system for example fast and high bit rate, multi-use interference and space division multiplexing technique, enlarge the range, deduction of errors because of multi-path fading along with another enormous benefit is the higher security. In multiuser MIMO system, the optimal bit rate is very much dynamic plus changes from one packet to the some other neighboring packet. This ignores traditional bit rate adaptation algorithm mechanism, which depends on recent history to calculate the excellent bit rate for the upcoming packets. In this project Turbo Rate adaptation scheme for Multi User Multiple Input Multiple Output LANs is recommended. Turbo Rate Adaptation method adjusts the bit rate based on a per packet basis if every client learns 2 variables. It's Signal to Noise Ratio when it transmits alone to the AP (access point), and the direction besides which its signal is received at the AP. A Turbo Rate client then clarifies its packets with these two variables and to allow different clients to choose the best bit rate as well as transmits simultaneously to the Access Point.
Keywords: MU MIMO, MISO, Rate Adaption, SDMA, Detection Algorithm

I. Introduction

In recent years, a considerable examine has been occurring in array antennas which are sufficiently brilliant to recognize required signal as well as interference signal. Presently, the role of Smart Antennas in mobile communications to enhance the ability of corresponding channels has reignited investigate and growth in this extremely exhilarating area. Such advance is a smart antenna and the kind of numerous accesses is based on SDMA technique.

A. Space Division Multiple Access

Spatial division multiple access method (SDMA) is differ from frequency division multiple access method (FDMA) as well as time division multiple access (TDMA) method. SDMA scheme in uses methods by which signals are differentiated at the base station derived from their origin place in space. SDMA is combination with FDMA, TDMA or CDMA (Code division multiple access) keeping in mind the end goal to offer the recent with the extra capacity to investigate the spatial property of the signals. The SDMA method is taking into account the idea that arriving a signal from a different sources reaches unlike antennas in an array at distinctive times because of their spatial distributions. This delay applies to differing from single or numerous clients in one region to other regions. This system permits efficient transmission starting with one cell then onto the next without disturbing a concurrent transmission. "Fig.1" demonstrates the essential SDMA system. For Ex, a GSM (global system for mobile communication) / GPRS (General packet radio service) permits just a single client at once to broadcast or acquire in frequency band to the base station. In the event that GSM/GPRS is utilized together with Space Division Multiple Access, multiple synchronous transmissions can occurs at same frequency band in like manner increases the capacity of the formation.

Since the "Fig.1", there are two beams of the similar frequency f1 at a same time t1, yet there are in distinctive directions. Therefore the capacity of the system is improved by a factor of two. With Spatial Division Multiple Access system several mobiles can share the same frequency.

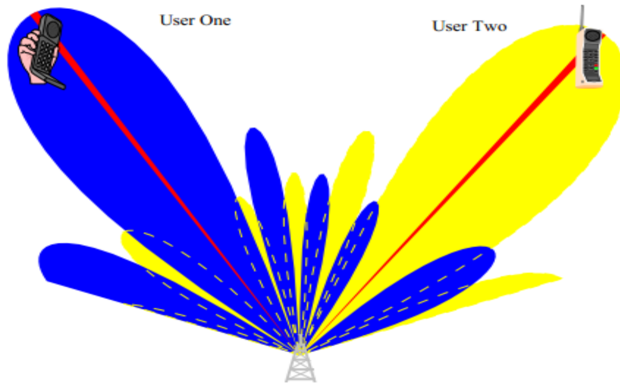

Fig. 1: SDMA scheme

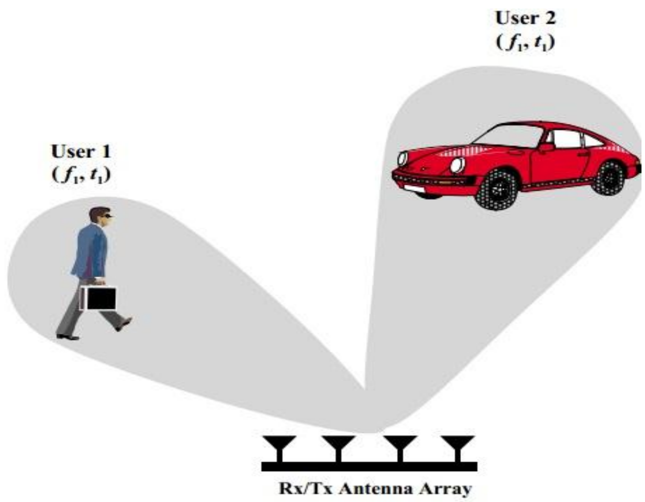

Fig. 2: SDMA Concepts

The arriving signals at the base station can be divided from the base station receiver as long as their angular partition is greater than transmit or receiving beam widths. Therefore, the Spatial Dimension can be exploited as a Hybrid Multiple Access technique supplementing FDMA, TDMA and CDMA. This methodology is typically indicated as SDMA and it empowers different clients inside of the same radio cell to be suited on the similar frequency and same time opening as represented in "Fig.2"

II. PROBLEM FORMULATION

In most recent couple of years a significant development in the advancement of wireless accessing technologies like internet services as well as cellular systems. As a result of them it is predicted that later on a tremendous advance in traffic will be experienced for individual and mobile communication. This is because of two certainties first one is an increment in the number of clients and second one is the starting of higher bit rate information services. This turns a major issue to resolve for the network provider. Their current some negative factors in the radiation-environment which adds to the limited capacity and another negative factor are co-channel interference which is brought on by an increment in the number of clients. The some different impairments add to the degradation in system performance and capacity are multipath fading, increase the delay occurred by signal reflection from buildings and Mountains and clients traveling in vehicles.

Remote Local Area Networks are having two patterns. Initially number of antennas on an access period is expanding consistently with ordinary Access Points today, having a few antennas. Second is on that point is a proliferation of little Wi-Fi devices for example sensors, game consoles and smart phones, which bear a less Form Factor and strict power limitations therefore normally utilize an one and only antenna.

These patterns cause a multiple antenna-APs to expend a huge division of its time communicating with only one antenna client. Accordingly, wireless-local area networks won't carry the greatest number of concurrent transmissions empowered by their infra-structure. To perceive this researchers have recommended to utilize of MU MIMO LANs, where multiple number of single-antenna clients simultaneously communicate with a multiple antenna access points. Researchers showed that decoding of such simultaneous communications is achievable both in the uplink as well as downlink. So far in any case, investigate on multiuser MIMO Wireless LANs has not tended to the bit rate selection issue or problem and essentially acknowledged that the transmitters recognize the best bit rate. This statement is applicable along the downlink where there is however single transmitter, the Access point, and subsequently the difficulty can be decreased to standard 802.11n rate adaptation technique. The uplink state is quite different. It has multiple numbers of concur renting transmitters that aggregately need to choose the optimal bit rates to their access point.

III. SYSTEM ARCHITECTURE

The "Fig.3" shows the system architecture of the project. In our project we derived mathematically these bellowed factors. Using these relations, we find out direction detection of the Third generation (3G) method and Fourth generation (4G) method. Looking at the design of 3G method and 4G methods, there is a slight bit different between the equations based on direction detection methods. Lastly, compare between the MISO (3 G) and MIMO (4 G) methods and lastly conclude that MIMO method is better than MISO.

A. Array Manifold Vector

Amount of Time Delay an electromagnetic wave undergoes when it hits the antenna elements is computed using Array Manifold Vector

B. Array Correlation Matrix Computation

The Array Correlation matrix gives the information about the correlation between the Noise and the signal elements

C. Direction Computation for 3G

The Direction Computation for 3G is computed utilizing the following equation

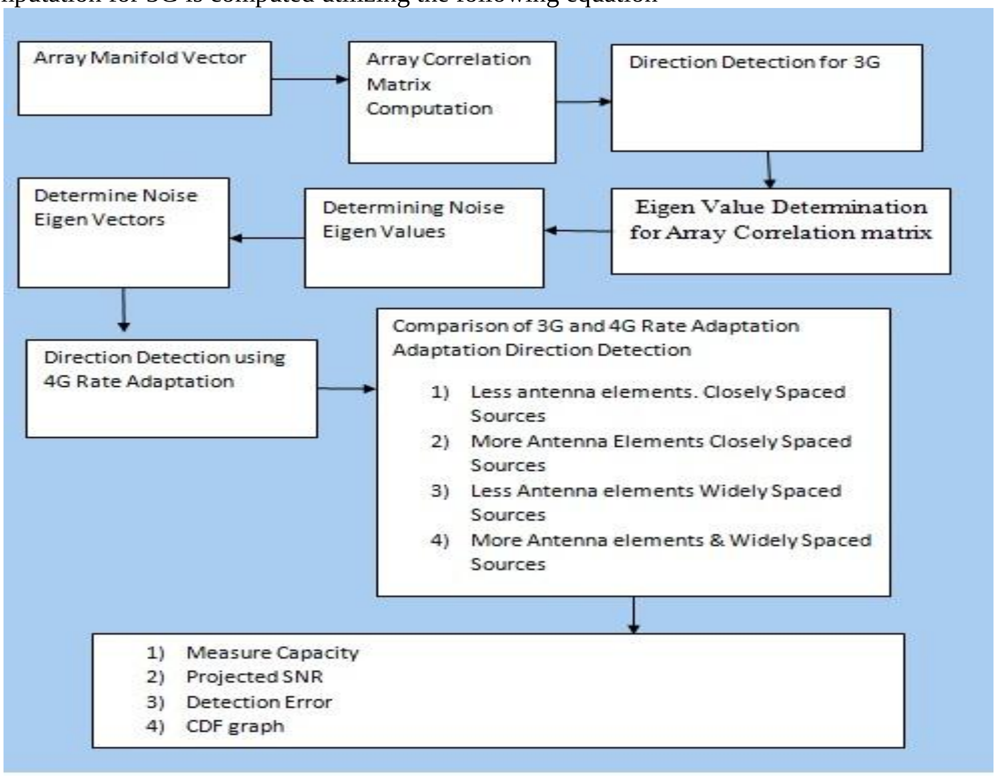

Fig. 3: System Architecture of Rate Adaptation Project

$$P_{MISO}(\theta) = \frac{S_\theta^H R S_\theta}{L^2}$$

Here, 'S_θ' presents the Steering Vector related with the direction θ, 'R' denotes Array Correlation Matrix. And 'L' denotes array elements

In MISO Direction estimation, an arrangement of steering vectors 'S_θ' is related with different directions θ is frequently mentioned to as the Array Manifold. Practically, it is calculated at the session of array calibration. Since utilizing both array manifold and an estimation of the Array Correlation Matrix, power of spectrum $P_B(\theta)$ is to be computed. Directions of the radiating sources taken as peaks in power spectrum.

D. Eigen Value Determination for Array Correlation matrix
The Eigen Values for the Array Correlation Matrix is obtained by finding out the roots of the characteristic equation

E. Determining Noise Eigen Values
The Eigen Values are sorted in ascending order and the first L-M eigen value corresponds to the noise. L is number of antenna elements and M is number of sources

F. Determine Noise Eigen Vectors
The Noise eigenvectors are found out by solving the following equation for multiple noise eigenvalues.

G. Direction Detection using 4G Rate Adaptation
The noise subspace Eigenvectors are orthogonal to the array of Steering Vectors at the Angles of Arrival $\theta_1, \theta_2, ...\theta_M$. Due to this orthogonal situation, can demonstrate that the Euclidean distance $d^2 = a(\theta)^H E_N E_N^H a(\theta) = 0$ for all angle of arrival $\theta_1, \theta_2, ...\theta_M$ .. Inserting this distance expression in the denominator occur sharp peaks at the angles of arrival.
The MIMO pseudo spectrum is given by

$$P_{MIMO} = \frac{1}{a(\theta)^H E_N E_N^H a(\theta)}$$

Where, ' $a(\theta)$ ' is steering vector of an angle θ and E_N denotes LxL M matrix consisting of a noise eigen vectors.

H. Comparison of 3G and 4G Rate Adaptation Direction Detection
1) Less antenna elements. Closely Spaced Sources
For this Number of Antenna Elements are chosen as 8 and Sources are present at 15 degree and one more source is present at 19 degree. The sources are said to be closely spaced if the angle of separation between the 2 sources is at least 4 degree
2) More Antenna Elements Closely Spaced Sources
For this Number of Antenna Elements are chosen as 100 and Sources are present at 15 degree and one more source is present at 19 degree. The sources are said to be closely spaced if the angle of separation between the 2 sources is at least 4 degree
3) Less Antenna elements Widely Spaced Sources
For this Number of Antenna Elements are chosen as 8 and Sources are present at 30 degree and one more source is present at 45 degree. The sources are said to be widely spaced if the angle of separation between the 2 sources is at least 15 degree
4) More Antenna elements & Widely Spaced Sources
For this Number of Antenna Elements are chosen as 100 and Sources are present at 30 degree and one more source is present at 45 degree. The sources are said to be widely spaced if the angle of separation between the 2 sources is at least 15 degree
5) Measure Capacity
The Capacity is computed using the following equation

$$C_{ratio}(\theta) = \frac{\log(1 + \sin^2(\theta)\ SNR_{orig})}{\log(1 + SNR_{orig})}$$

$$\theta = direction\ of\ source$$

$$SNR_{org} = SNR\ of\ the\ original\ signal$$

IV. MISO METHOD OF DETECTION

In this technique [21] a rectangular window of uniform weighting is applied to the time series data to be analyzed. The 3G Cognitive method is also defined as "Ordinary Beamforming Method (OBM)". This method calculates the mean power 'PB (θ)' by steering the array in θ direction.

The power spectrum in 3G Method Cognitive method is presented as

$$P_B(\theta) = \frac{S_\theta^H R S_\theta}{L^2} \tag{1}$$

Where, 'S_θ' presents the steering vector connected with the direction θ, and 'R' denotes the array correlation matrix and 'L' is the number of array elements

In DETECTION evaluation, arrangement of steering vectors 'S_θ' is connected with a variety of direction θ is often referred to as the array manifold. Practically it may be measured at the time of array calibration. From the array manifold and an estimate of the array correlation matrix '$P_B(\theta)$' is computed. Peaks in '$P_B(\theta)$' are then taken as the directions of the radiating sources.

A. *Mathematical Analysis of 3G method cognitive method*

1) The steering vector ‘A’ for an antenna array comprising of L elements is calculated by using eq (1).

2) The signal amplitude vector ‘s’ is a column vector of order Mx1 is given by

$$s = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ \vdots \\ a_M \end{bmatrix} \quad (2)$$

Where, a1, a2, ……., aM are amplitude of M sources

3) The Hermitian Transpose ‘s^{H}’ of signal vector S given by

$$s^H = \begin{bmatrix} a_1^* & a_2^* & \dots & \dots & a_M^* \end{bmatrix} \quad (3)$$

4) The Signal Correlation Matrix (P) given by

$$P = E[ss^H] \quad (4)$$

Substitute the value of s and s^H from equations can obtain equation

$$p = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ \vdots \\ a_M \end{bmatrix} * \begin{bmatrix} a_1^* & a_2^* & \dots & \dots & a_M^* \end{bmatrix} = \begin{bmatrix} a_1 a_1^* & a_1 a_2^* & \dots & \dots & a_1 a_M^* \\ a_2 a_1^* & a_2 a_2^* & \dots & \dots & a_2 a_M^* \\ \vdots & \vdots & \vdots & & \vdots \\ \vdots & \vdots & \vdots & & \vdots \\ a_M a_1^* & a_M a_2^* & \dots & \dots & a_M a_M^* \end{bmatrix} \quad (5)$$

5) The signal vector ‘S’ is MxM diagonal matrix comprises only diagonal elements of matrix ‘P’ is given by

$$S = \begin{bmatrix} a_1 a_1^* & 0 & \dots & \dots & 0 \\ 0 & a_2 a_2^* & \dots & \dots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ \vdots & \vdots & \vdots & & \vdots \\ 0 & 0 & \dots & \dots & a_M a_M^* \end{bmatrix} \quad (6)$$

6) The Signal subspace is a LxL matrix is given by

$$R_s = ASA^H \quad (7)$$

7) The Noise subspace is LxL matrix is given by

$$R_n = \sigma^2 I = \sigma^2 \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & 1 \end{bmatrix} = \begin{bmatrix} \sigma^2 & 0 & \dots & 0 \\ 0 & \sigma^2 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & \sigma^2 \end{bmatrix} \quad (8)$$

Where, σ^2 is a variance of noise and I denotes identity matrix

8) The array correlation matrix is given by

$$R = R_S + R_n \quad (9)$$

Where, R_S is signal subspace and R_n is noise subspace

9) Compute the steering vector by using equation (1)

10) The value of the power spectrum is found by using equation (4)

This power spectrum is computed by keeping array correlation matrix constant and varying ‘θ’ in the range $-\pi/2<\theta+0.001<\pi/2$.

V. RATE ADAPTION DETECTION METHOD

Rate Adapt Detection Method is an acronym which stands for Hanan Quenon. 4G Rate Adaption Method is used to give unbiased estimation of the quantity of signals and its Angles of Arrivals furthermore strength of the waveforms. 4G RATE ADAPTATION METHOD guarantees the presumptions that the interference in every channel is uncorrelated by creating the Noise Correlation Matrix diagonal. The incident signals are correlated by making a non diagonal Signal Correlation Matrix. By the by, under high signal correlation the traditional 4G RATE ADAPTATION Method algorithm breaks down and other methods are to be implemented to correct this weakness. We must realize that the number of signals is M then the quantity of signal Eigenvalues and Eigenvectors is M and the quantity of noise Eigenvalues and Eigenvectors are L-M (array elements denoted as L). Because 4G RATE ADAPTATION METHOD achieves the Noise Eigenvector Subspace, it is occasionally defined as a Subspace Method.

The Eigenvalues and Eigenvectors of the correlation matrix R are initiate. ‘M’ Eigenvectors are related with the signals and ‘L−M’ Eigenvectors connected with the noise are alienated. The Eigenvectors are associate with the littlest Eigenvalues are used to find the power spectrum. For uncorrelated signals the smallest-Eigenvalues are equal to the Variance of the noise. The L×(L−M) dimensional Subspace spanned by the Noise Eigenvectors is defined by

$E_N = [e_1\, e_2\, e_3 \,................\, e_{L-M}]$ where 'e_i, is ith eigenvalue. (1)

The Noise Subspace Eigenvectors are $\theta_1, \theta_2, ...\theta_M$. Orthogonal to the array of Steering Vectors at the Angles of Arrival. Since, this orthogonal condition, it can tell that the Euclidean distance $d^2 = a(\theta)^H E_N E_N^H a(\theta) = 0$ for each Angle of Arrival $\theta_1, \theta_2, ...\theta_M$. Substituting this distance formula in the denominator side which creates sharp peaks at the Angles of Arrival. The 4G RATE ADAPTATION METHOD Pseudo Spectrum is defined by

$$P_{MUSIC} = \frac{1}{a(\theta)^H E_N E_N^H a(\theta)} \tag{2}$$

Where $a(\theta)$ is the Steering Vector of an angle angle θ and 'E_N, is the Lx L-M matrix comprising of Noise Eigenvectors.

A. Simulation Methodology of 4G RATE ADAPTATION METHOD Algorithm

1) *The Steering Vector A for an antenna array consisting 'L' elements is calculated by using below equation*

$$A = \begin{bmatrix} 1 & 1 & \cdots\cdots & 1 \\ e^{i2\pi d \sin\theta_1} & e^{i2\pi d \sin\theta_2} & \cdots\cdots & e^{i2\pi d \sin\theta_{M-1}} \\ \vdots & \vdots & \vdots & \vdots \\ e^{i2\pi d (L-1)\sin\theta_1} & e^{i2\pi d (L-1)\sin\theta_2} & \cdots\cdots & e^{i2\pi d (L-1)\sin\theta_{(M-1)}} \end{bmatrix}$$

The next steps are same in previous chapters are taken, it menace to derive the equations up to 8 th step (equation 9)

9) *After deriving Array correlation matrix then to find the Eigen values of an Array Correlation matrix by performing the Eigen values decomposition method.*

The Eigen values of LxL Array Correlation matrix (R) are establish by performing the Characteristic eq is known by

$$|R - \lambda I| = 0 \tag{10}$$

The result to the eq gives L Eigenvalues $\{\lambda_1, \lambda_2, ..., \lambda_L\}$.

The Eigenvector for particular Eigenvalue λ_a is establish by solve the eq followed by

$$R\, V_n = \lambda_a V_n \tag{11}$$

Here V_n denotes Lx1 matrix consisting number of unknown variables.

Expand the eq in matrix notation we get

$$\begin{bmatrix} R_{0,0} & R_{0,1} & \cdots & R_{0,L} \\ R_{1,0} & R_{1,1} & \cdots & R_{1,L} \\ \vdots & \vdots & \vdots & \vdots \\ R_{L,0} & R_{L,1} & \cdots & R_{L,L} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ \vdots \\ V_L \end{bmatrix} = \lambda_a \begin{bmatrix} V_1 \\ V_2 \\ \vdots \\ V_L \end{bmatrix}$$

Multiply the matrices with a set of simultaneous eqs as characterized in are gotten

$$\begin{array}{l} R_{0,0} V_1 + R_{0,1} V_2 + ... + R_{0,L} V_L = \lambda_a V_1 \\ R_{1,0} V_1 + R_{1,1} V_2 + ... + R_{1,L} V_L = \lambda_a V_2 \\ \vdots \qquad \vdots \qquad \vdots \qquad \vdots \qquad \vdots \; \vdots \\ R_{L,0} V_1 + R_{L,1} V_2 + ... + R_{L,L} V_L = \lambda_a V_L \end{array}$$

While there are L unknown variables, hence here contain L simultaneous eqs can be solved to get $V_1, V_2, ..., V_L$. . Those 'L' values forms Eigenvector matrix.

10) *The noise Eigen values are selected from all Eigen values*

11) *The power is calculated by using*

$$P_{HQ} = \frac{1}{a(\theta)^H E_N E_N^H a(\theta)} \tag{2}$$

E_N is the noise Eigen vectors

VI. RESULTS

A. *MISO Method*

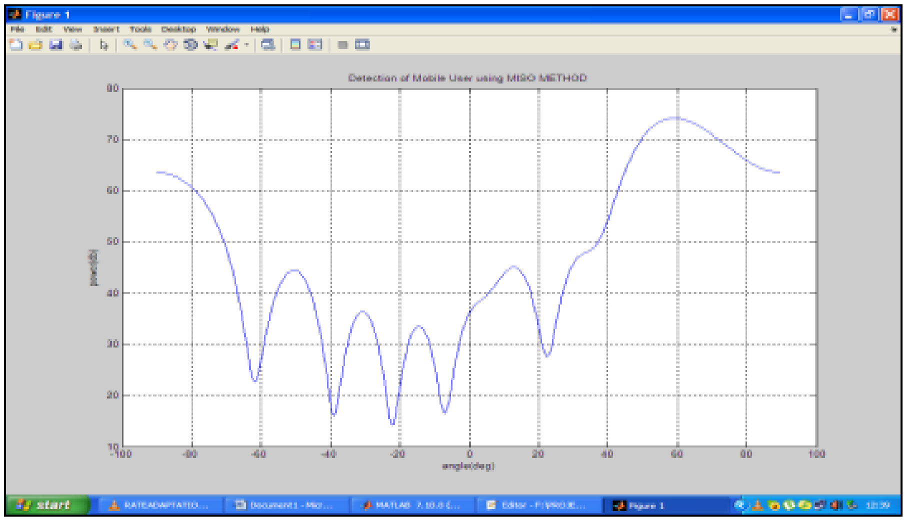

Fig. 4: shows X axis as angle (deg) and y axis as power (db) for Detection of Mobile User using MISO METHOD (MULTIUSER)

In the above "Fig.4" shows the operation of multi user MISO method in which X axis is a ranging of antenna, where angle of antenna is varies -90 degree to +90 degrees. The above example we take 3 mobile users .The above non uniform array in which consists antenna elements are the number of inputs say in example antenna elements are 8. In multiuser MISO method the number of EM waves is equals to number of mobile users. Hence we take three different amplitudes of three different EM wave strikes at antenna at base station say first is at amplitude is 1, second is 2 and third is at 5. Similarly, we enter three different directions from where EM wave strikes at the antenna array say some examples 10 degree, 45 degree and 60 degrees. The above figures we only identify the mobile user direction at 10 degrees but we can't distinguish at 45 degrees and at 60 degrees. Therefore incase of multiple mobile user in MISO method is not capable of detecting the mobile users significantly.

B. *MIMO Method*

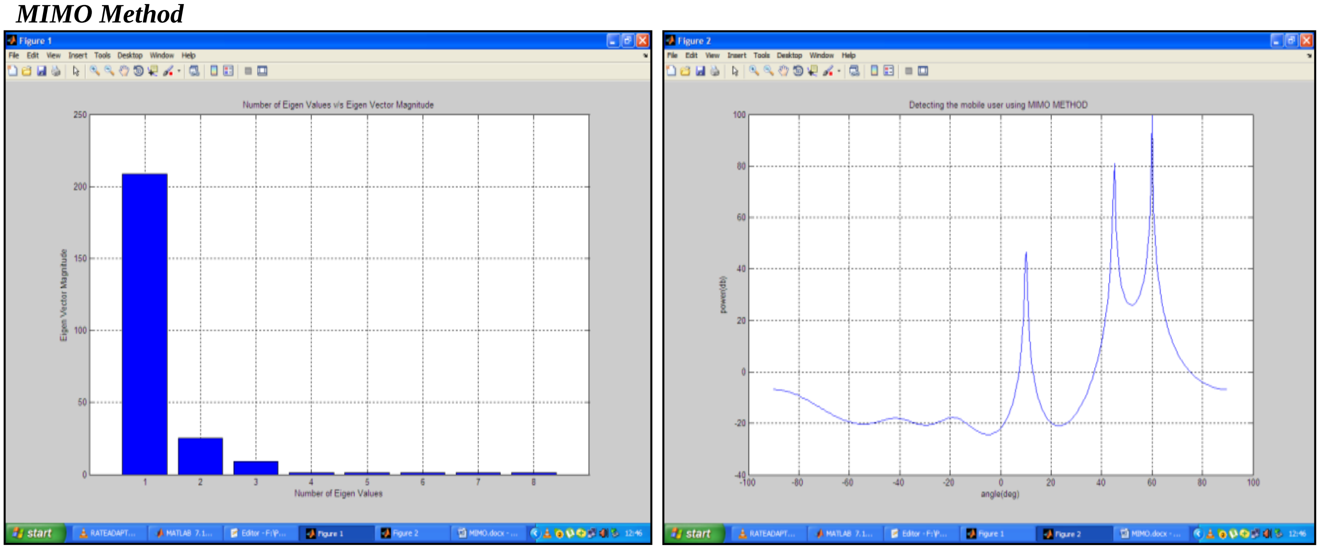

Fig. 5:(A) shows X axis as Number of Eigen Values and y axis as Eigen Vector Magnitude for Number of Eigen values v/s Eigen Vector Magnitude. Fig. 5:(B) shows X axis as angle (deg) and y axis as power (dB) for Detection the Mobile User using MIMO METHOD

Similarly, in multiuser MIMO we take number of three mobile users and number of eight antenna elements. In multiuser MIMO method the number of EM waves is equals to number of mobile users. Hence we take three different amplitudes of three different EM wave strikes at antenna at base station say first is at amplitude is 1, second is 2 and third is at 5. Similarly, we enter three different directions from where EM wave strikes at the antenna array say some examples 10 degree, 45 degree and 60 degrees.

In multi user MIMO method we can easily find out the direction of mobile user, as saw in figure. We enters the direction is at 10 degree, 45 degree and 60 degrees hence we seen in figure peak signal is at around at 10, 45 and 60 degrees which is clear and also it is out of disturbance as compared to MISO method. This indicates that MIMO has the capability to detect the mobile directions in best way

C. Comparison between MISO and MIMO

We need to calculate the capacity of MIMO and we need to see how the SNR is getting increased and we need to see how the capacity of MIMO behaving with respect to the angle and we need to see what is the amount of error produced by MISO or MIMO algorithm. So that we can execute by the turbo rate mechanism. Here “Fig.6A” indicates original SNR is on X axis and projected SNR is Y axis. If you see in the graph when original SNR is increase as well as projected SNR is an increase. If the original SNR is 10 and your projected SNR is 10+0.4 that it indicates. So in MIMO method smallest gain resolutions mean 0.4 will also measured, but in MISO it is difficult. Fig.6B” indicates the angle between 2 clients verses reduction ratio in SNR as see in the graph. The angle between two client’s increases the reduction in the SNR will also increase.

“Fig.6C” is one of the important graphs, according to MIMO the SNR of a mobile device in case MIMO is vary from 5 to 26 dB in this range. We consider various SNR ranges such as 5 dB,8 dB, 11 dB, 14 dB, 17 dB, 20 dB, 23dB, 26 dB. We kept the angle between 0 to 90 degrees, because we considering uniform linear array and MIMO presented at both transmitter and the receiver. Since we consider uniform linear array the variability will vary from -90 degree to +90 degree. But in our graph shows us considering only positive angles 0 to 90 degrees and for this fixed SNR is calculate w.r.t capacity. If the angle increases the capacity also increases which is seeing in graph.

“Fig.6D” indicates SNR OF 5 dB are treating as low SNR mobile, 17 dB are treating as medium SNR mobile and 26 dB treating as high SNR mobile. For CDF (cumulative distributed function) is plotted in the range between 0 to 1. It classifies or normalizes the value of capacity between 0 to 1. When we divide the capacity by the maximum value this becomes CDF graph. If you seen mobile with low SNR is also capacity increases, medium SNR is also capacity increases similarly high SNR is also capacity is increases has the angle between two clients increases. It indicates that whether it has low SNR, if the angle between two mobile users is further then the MIMO doesn’t bothered about SNR, it can extract the signal. Therefore if MIMO capacity is high then it can send more packets. But in MISO all 3 mobile users have same peak, but only one mobile can send the packet not for all mobiles. Rate adapter will take both the angle as well as rate adaption and it will send more packets towards the users and no packets towards other users.

“Fig.6E” shows plotting actual direction verses estimated directions, in the graph some cases values are overlaps and in some cases variations are present but estimated direction is high. “FiG.6F” shows plotting actual direction verses estimated directions. In the MIMO method fewer variations are present compared to MISO method hence in the graph it shows almost overlapped in values.

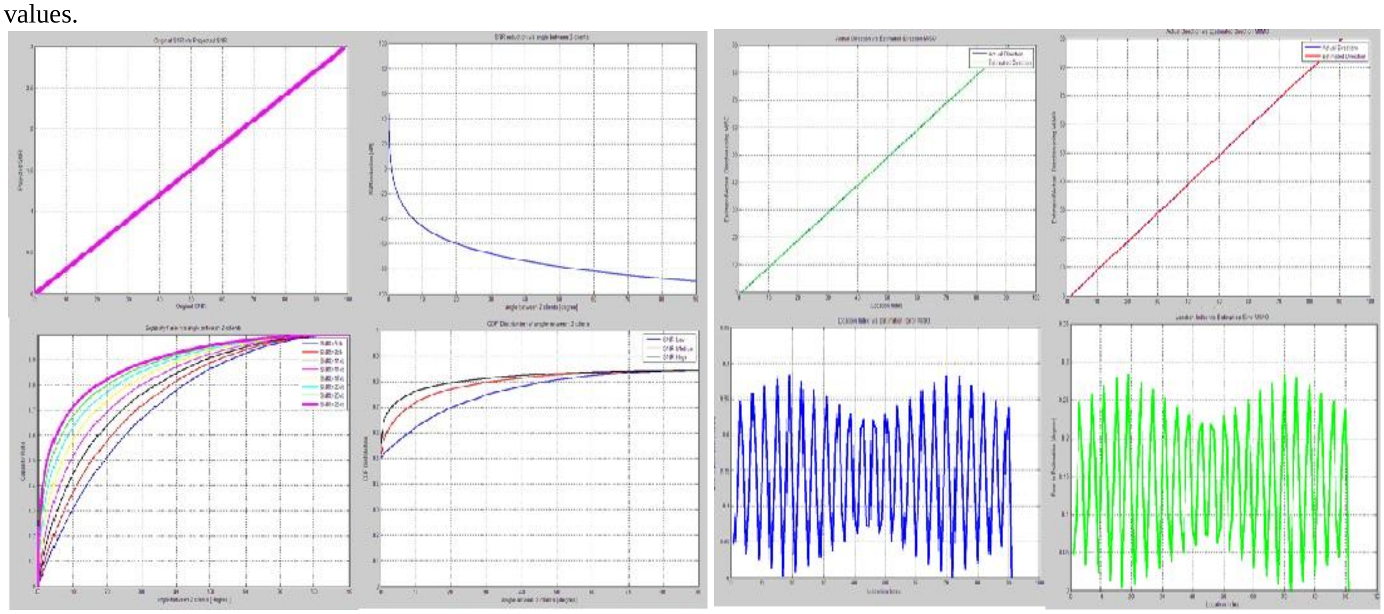

Fig. 6A: shows x axis as Original SNR and y axis as Projected SNR. Fig. 6B: shows x axis as angle between 2 clients [degree] and y axis as SNR reduction [db]. Fig.6C: shows x axis as angle between 2 clients [degree] and y axis as Capacity Ratio. Fig.6D: shows x axis as angle between 2 clients [degree] and y axis as CDF Distribution. Fig.6E: shows x axis as Location Index and y axis as Estimated\Actual Direction using MISO. Fig.6F: shows x axis as Location Index and y axis as Estimated\Actual Direction using MIMO. Fig.6G: shows x axis as Location Index and y axis as Error in Estimation [degree] using MISO. Fig.6H: shows x axis as Location Index and y axis as Error in Estimation [degree] using MIMO

“Fig.6G” and “Fig.6H” shows plotting a graph location detection verses estimated error of MISO and MIMO methods respectively. The X axis shows location index and Y axis shows estimation error.

D. Comparison of detection of mobile users between MISO and MIMO

In order to compare MIMO and MISO we need to consider four following functions.

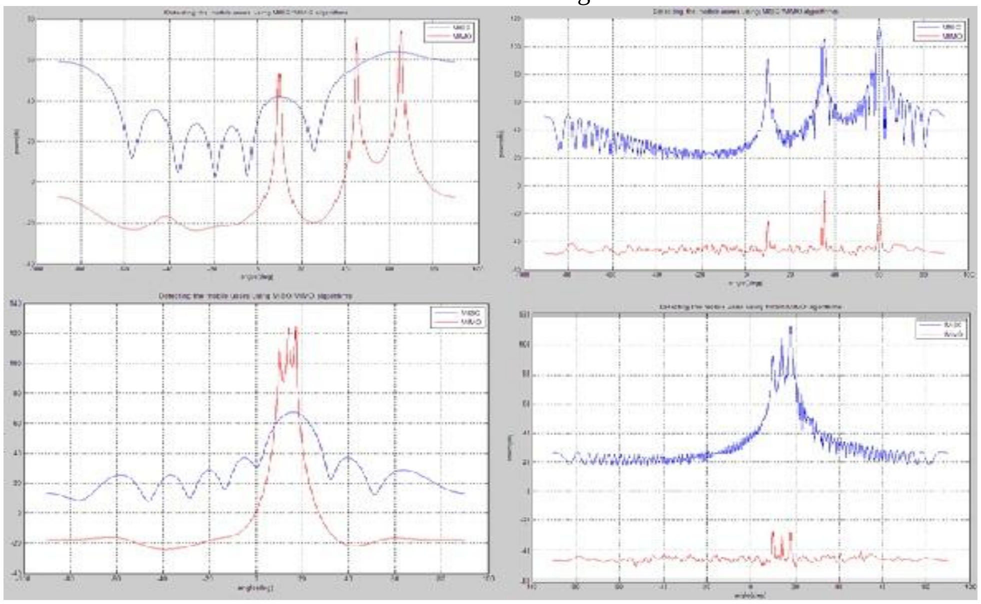

Fig. 7A: shows X axis as angle (deg) and y axis as power(db) for detecting the mobile user using MISO,MIMO algorithms. Fig.7B: a& b shows X axis as angle(deg) and y axis as power(db) for Detecting The Mobile User using MISO,MIMO algorithms. Fig.7C: a & b shows X axis as angle(deg) and y axis as power(db) for Detecting The Mobile User using MISO,MIMO algorithms Fig.7D: a & b shows X axis as angle(deg) and y axis as power(db) for Detecting The Mobile User using MISO,MIMO algorithms

1) Less antenna elements. Widely Spaced Sources

For this lesser number of Antenna Elements is chosen as 8 and widely spaced and enters the amplitude of the first EM wave is 1 and direction is 10 degree similarly amplitude of second EM wave is taken as 2 and direction is 45 degree and lastly third EM wave amplitude is 3 and its direction is at 65 degree. The sources are said to be widely spaced if the angle of separation between the 2 sources is at least 15 degree. If we see in the figure MISO algorithm is not capable of detecting multiple mobiles at the same time, where as MIMO system is capable of detecting multiple mobiles at same time. It has produce unique distinguish peaks at each mobile user directions at 10, 45, 65 degrees.

2) More Antenna Elements Widely Spaced Sources

For this Number of Antenna Elements are chosen as 100 and Sources are present at 30 degree and one more source is present at 45 degree. The sources are said to be widely spaced if the angle of separation between the 2 sources is at least 15 degree Here both MIMO and MISO can detect the mobiles very efficiently. For the case number of antenna elements are high, both are performing in a very good way, but MIMO produces narrower peak compares to MISO. The amount of disturbance in terms of power is high in case of MISO as compared to MIMO

3) Less Antenna elements Closely Spaced Sources

For this number of Antenna Elements are chosen as 8 and number of mobile users are 3. Sources are present at 10 degree and 14 and one more is 17 degree. The sources are said to be closely spaced if the angle of separation between the 2 sources is at least 4 degree

4) More Antenna elements & closely Spaced Sources

For this, number of Antenna Elements is chosen as 100 and number of mobile users are 3 and Sources are present at 10 degree and one more source is present at 14 degree and another one is 18 degree. The sources are said to be closely spaced if the angle of separation between the 2 sources is at least 4 degree.

The above figures shows both the MIMO and MISO algorithms are same pattern. As compare to MIMO, in MISO system the amount of power is larger. Hence in MIMO system the amount of power wasted is less. The conclusion regarding in four cases is the MIMO method performs the best, but MISO is little bit good.

VII. CONCLUSION

Smart Antenna is a technology that gives wireless-networks with fewer latency and higher data bit rates. To raise the capacity of the channels, novel technologies like multiple inputs and multiple outputs (MIMO) can be applied, alongside the smart antennas to give greater capacity of the channels. In this paper introduces Turbo Rate adaption method, a distributed rate adaption protocol for multi user MIMO LANs. The Rate adaptation algorithm was divided into MISO detection, MIMO Noise Subspace Detection and the algorithms were compared with respect to Bias and Resolution. MIMO Mobile detection has always better as compared to MISO Mobile detection. The carrying out demonstrates that enabling Multiuser-MIMO with traditional rate adaptation lessens the throughput in many occasions, while enabling Turbo Rate in Multiuser-MIMO raises the network throughput respectively.

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