INTERNATIONAL JOURNAL OF TECHNOLOGY AND COMPUTING (IJTC)
*ISSN-2455-099X,*
*Volume 1, Issue 1, OCTOBER 2015.*

# Optimum Power Utilization for MIMO Wireless Network using signal-to-interference-and-noise (SINR) ratio and optimal transmission power (OTP)

Monika Gosain [a], Satvir Singh [b]

[a]Associate Professor, CSE Department , GGSCMT, Kharar

[b]Student, GSCMT, Kharar

## ABSTRACT

A Multiple Input Multiple Output (MIMO) cellular network where a base station (BS) can transmit data cyphers to a mobile station (MS) assumed as fixed. In this paper, to improve the performance of optimum power utilization in MIMO wireless networks using dynamic semi-definite relaxation in terms of signal-to-interference-and-noise (SINR) ratio and optimal transmission power (OTP). The procedure is proposed to decrease the number of lively or active assistance links and concurrently elevate the beam forming vectors between BSs and mobile station which is assume to be fixed. Here the BSs subject to signal-to-interference-and-noise-ratio (SINR) constraints at the mobile station. Finally we compare the peak OTP, peak SINR, average OTP and average SINR.

*Keywords:* Signal-to-interference-and-noise (SINR), base station (BS), Multiple Input Multiple Output (MIMO), mobile station (MS), optimal transmission power (OTP).

## I. INTRODUCTION

The concept of MIMO (Multiple-Input Multiple-Output) system are very vast in WSN development. Multiple Input Multiple Output (MIMO) technology defined as the use of multiple antennas at the transmitter and/ or multiple antennas at the receiver of the system communication. Improving spectral capacity is today's greatest requirement while dealing with wireless communications .This requirement is greatly answered by using the concept of MIMO (Multiple-Input Multiple- Output). The multiple-input multiple-output systems enables to increase the spectral efficiency for a given transmit power. Over single-antenna-to-single-antenna (SISO) communication MIMO systems provide a number of advantages. Especially the sensitivity to fading is reduced by the spatial Diversity by providing multiple spatial paths. And for high spectral-efficiency communication the power requirements are significantly reduced by avoiding the compressive region of the information-theoretic capacity bound. The spectral efficiency is defined as the total number of information bits /second/Hz transmitted from one array to the other. MIMO technology achieves the multipath behavior by using multiple antennas at transmitter side and as well as receiver side and by providing Spatial Diversity to dramatically increase the channel capacity. By using the spatial diversity MIMOs are able to allow multiple antennas to send and receive multiple spatial streams at the same time. This paper, we show that even the use of multiple antennas system significantly improves the spectral efficiency of the communication system; it brings more requirements in terms of the total energy consumption per bit. The behavior of the cost in terms of the total energy consumption as a function of the maximum achieved system capacity.

This will contribute to optimal design for the low-power high-efficiency communication system which corresponds to the number of antennas for which we can get the lowest costs in energy consumption for a required level of system capacity. In MIMO cellular network, the base stations (BSs) entertained as transmission of data to mobile stations. Although theoretically attractive, deploying MIMO in a commercial cellular system is basically different as the transmission in each cell acts as interference to other cells, and the entire network is essentially interference-limited. User data and channel state information (CSI) can be shared over the backhaul links to jointly encode and transmit data signals to users with multi cell cooperative processing in order to exploit the inter cell interference, which is known to be a limiting factor in conventional cellular networks. While the problem of interference is inherent to cellular systems, its effect on MIMO is more significant because each neighboring BTS antenna element can act as a unique interfering source, thereby making it difficult for the mobile to estimate and suppress them. With Nr receive antennas; each mobile can only cancel/decode up to Nr different sources using linear techniques Furthermore, interference is more severe for the downlink because complicated interference suppression techniques are not practical for mobile terminals, which need to be power-efficient and compact. Coordination between users is usually not allowed. The capacity gains promised by MIMO techniques have been shown to degrade severely in the multi-cell environment.

A MIMO (multiple-input multiple-output) framework comprises of various antennas at the receiver and transmitter end which can be utilized to enhance the execution of the framework through spatial assorted qualities or expand the information rates by spatial multiplexing. One can likewise utilize a percentage of the reception apparatuses for differences and some for spatial multiplexing. The number utilized for differences and spatial multiplexing relies on upon the application.

The two main basic formats of MIMO are:

A. Spatial Diversity Spatial diversity used in this narrower sense often refers to transmit and receive diversity. These two methodologies are used to provide improvements in the signal to noise ratio and they are characterized by improving the reliability of the system with respect to the various forms of fading.
B. Spatial Multiplexing for providing higher data rate capacity by utilizing different paths to carry additional traffic i.e. increasing the data throughput capability the concept of spatial multiplexing is used.

**(i) Statistical MIMO Model: -** Recall that delay spread and Doppler spread are the most important factors to consider in characterizing the SISO system. In the MIMO system which employs multiple antennas in the transmitter and/or receiver, the correlation between transmit and receive antenna is an important aspect of the MIMO channel. It depends on the angle-of-arrival (AoA) of each multi-path component.

**(ii) PAS Model**: - As discussed above, PAS is an important factor in determining the spatial correlation between antenna elements. In fact, a mathematical analysis for spatial correlation requires a distribution of PAS for the real environments. We find that there are various types of PAS models available from the actual measurements of the different channel environments (e.g., indoor or outdoor, macrocell or microcell), including those summarized. Pattern of PAS depends mainly on the distribution of the locally-scattered components. In general, enormous amounts of locally-scattered components are observed by the MS in all different environments. Therefore, its PAS usually follows a uniform distribution. For the BS, however, the different PAS distributions are observed depending on the characteristics of terrain in a cell, which is usually shown to have a small AS. Note that they still show a uniform PAS distribution for the BS in picocells or indoor environments.

**A. CAPACITY OF MIMO SYSTEMS**

From the numerical perspective, the MIMO System is performed through a network and not only a vector channel, so it is conceivable to transmit numerous parallel sign streams all the while in the same recurrence band and in this way increment unearthly proficiency. This strategy is called spatial multiplexing. The information stream is encoded with vector encoder and transmitted simultaneously by transmitters. The MIMO radio channel acquaints twisting with the sign. The beneficiary has reception apparatuses. Every radio wire gets the signs from all transmit reception apparatuses, and thusly the got signs show between channel impedance. The got signs are down changed over to the base band and inspected once per image interim. The MIMO handling unit gauges the transmitted information streams from the examined base-band signals. The vector decoder is a parallel-to serial converter, which consolidates the parallel information streams to one yield information stream.

A MIMO system typically consists of m transmit and n receive antennas. By using the same channel, every antenna receives not only the direct components intended for it, but also the indirect components intended for the other antennas. A time-independent, narrowband channel is assumed.

**General MIMO**

The following transmission formula results from receive vector y, transmit vector x, and noise n:

$$y = Hx + n$$

## II. Literature Review

**Fakhri Youssef et al (2013)**: In this paper, Energy efficiency is a first concern in Wireless Sensor Networks (WSNs). It intends to augment the system lifetime which is characterized as the time span until the battery exhaustion of the first hub. The point of our methodology is to give the ideal transmission force considering the sign to clamor proportion (SNR) requirement at the Fusion Center (FC) while ensuring the obliged execution. In this article, we address the lifetime expansion issue under non-orthogonal channels expecting two cases. In the first case, the hubs have the ideal learning of all channel picks up. While in the second case, we propose a few augmentations to the unacknowledged channel picks up by the hubs. In both cases, we consider that the hubs transmit their information to the FC over Quasi-Static Rayleigh blurring Channel (QSRC). Reproduction results demonstrate that the proposed ideal force assignment strategy amplifies the system lifetime better than the EP technique.

**M. Sasi Pavani et al (2014):** In this paper, MIMO systems are the most power expending segments on the grounds that they utilize numerous RF chains and various reception apparatuses. Because of the presence of numerous RF chains which thusly contain power speakers, LNA’s and different circuit elements, the circuit power consumption increases exponentially which becomes a severe problem in short-range communication scenarios like 802.11- based WLAN etc. The proposed antenna management scheme satisfies all the requirements of MIMO systems like BER, data rate, SNR. Channel capacity maximization of MIMO networks using Antenna selection techniques is also presented. Antenna selection techniques select the antennas which gives the best Signal to Noise ratio.

**Algorithm:**

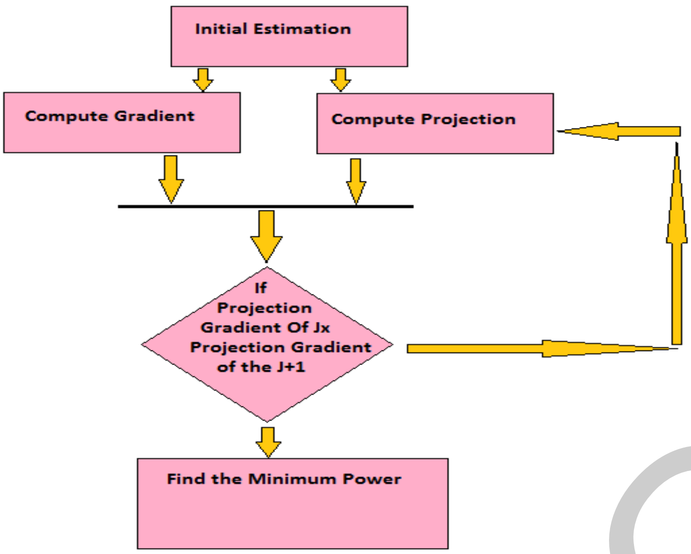


**Fig. 1: Flow Chart of Projection Gradient**

## III. Results

We here implement both Semi definite relaxation and Dynamic Semidefinite relaxation. The analysis of both relaxation schemes performance in terms of:

1 Gradient

2 Projection

Graphical User Interface:

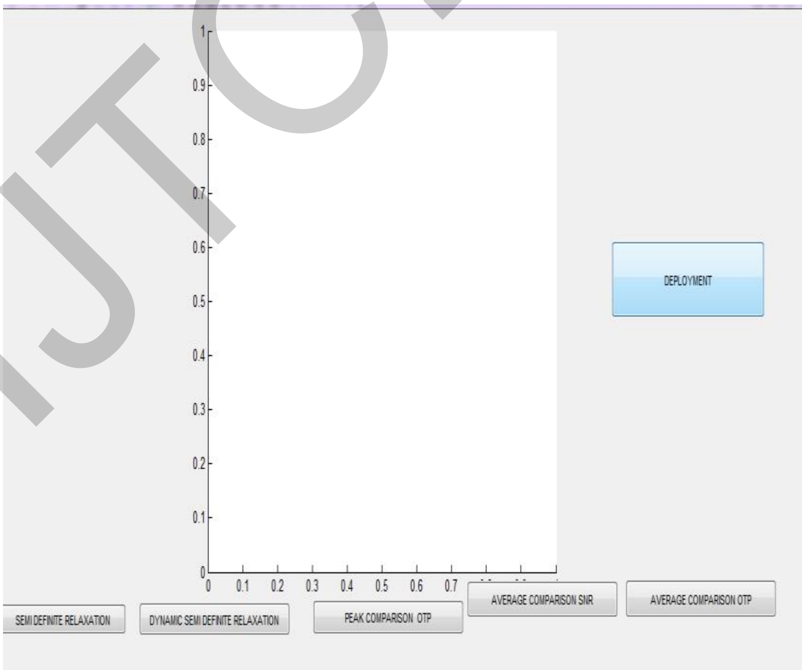


**Fig. 2: GUI of the simulation**

INTERNATIONAL JOURNAL OF TECHNOLOGY AND COMPUTING (IJTC)
*ISSN-2455-099X,*
*Volume 1, Issue 1, OCTOBER 2015.*

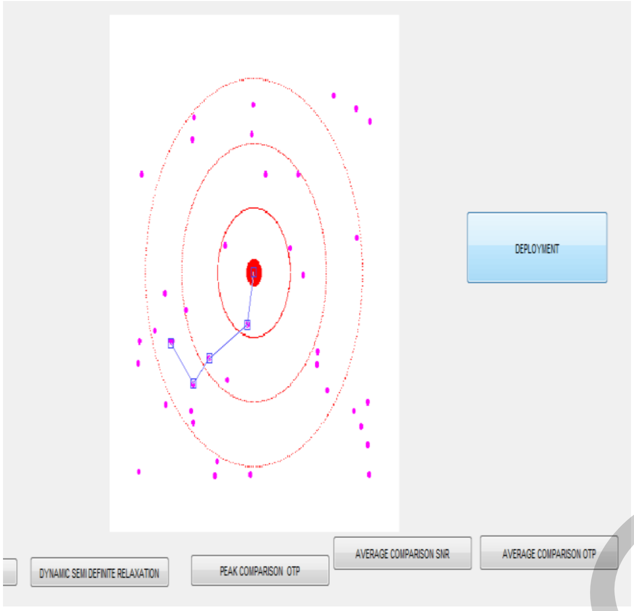


**Fig. 3: path establish to connect with base station**

Here we add the node which connect to the base station as shown in below fig. it finds the path by which it is connecting to the base station.

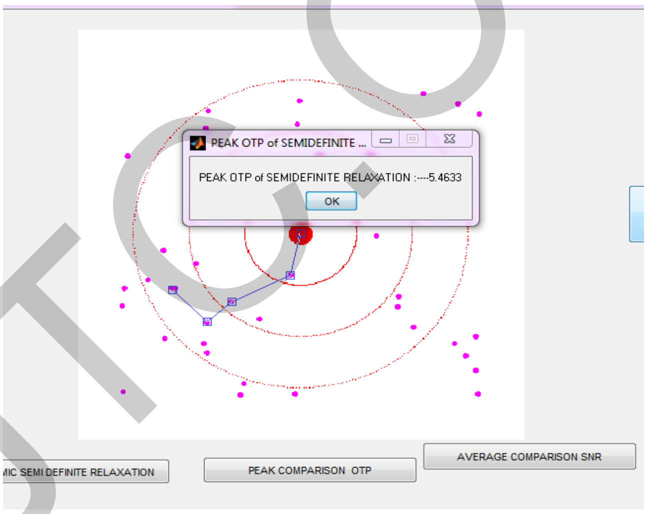


**Fig. 4: Peak Value of Semi Definite Reflection**

Here the peak comparison of OTP shows that there is decrease in power.

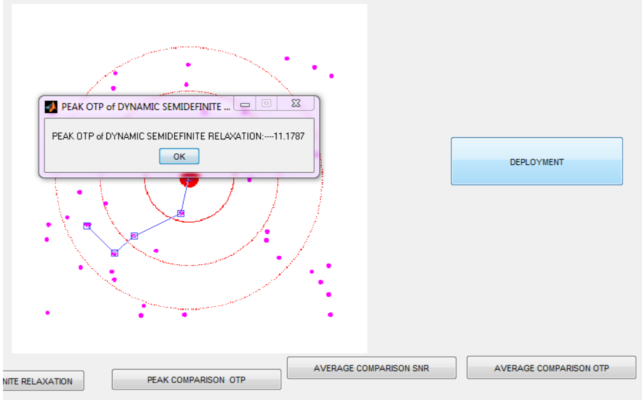


**Fig. 5: Peak OTP**

## IV. Conclusion

In this paper we used an algorithm which aims to maximize the network lifetime under Non-Orthogonal channel configuration. In this method we are extracting the estimation of the overall SNR and OTP value.

## REFERENCES

[1] Arash Khabbazibasmenj, Member, IEEE, Aboulnasr Hassanien, Member, IEEE, Sergiy A. Vorobyov, Senior Member, IEEE and Matthew W. Morency “Efficient Transmit Beamspace Design for Search-Free Based DOA Estimation in MIMO Radar” IEEE Transactions on Signal Processing

[2] C. Han, *et al.*, “Green radio: radio techniques to enable energy-efficient wireless networks”, *IEEE Commun. Mag.*, Vol. 49, No. 6, June 2011.

[3] D. Valerdi, Q. Zhu, K. Exadaktylos, S. Xia, M. Arranz, R. Liu, and D. Xu, “Intelligent energy managed service for green base stations”, *IEEE Globecom GreenComm. Workshop*, Dec. 2010

[4] E. Oh, B. Krishnamachari, X. Liu, Z. Niu, “Toward dynamic energyefficient operation of cellular network infrastructure”, *IEEE Commun. Mag.*, Jun. 2011

[5] Hongyuan Zhang, Huaiyu Dai, "Cochannel Interference Mitigation and Cooperative Processing in DownlinkMulticell Multiuser MIMO Networks", EURASIP Journal onWireless Communications and Networking 2004:2, 222–235, Hindawi Publishing Corporation

[6] H. Dai, A. Molisch, and H. Poor, “Downlink capacity of interference-limited MIMO systems with joint detection,” IEEE Trans. Wireless Commun., vol. 3, no. 2, pp. 442–453, Mar. 2004.

[7] R. S. Blum, “MIMO capacity with interference,” IEEE J. Select. Areas Commun., vol. 21, no. 5, pp. 793–801, Jun. 2003.

[8] S. Zhou, J. Gong, Z. Yang, Z. Niu, P. Yang, “Green Mobile Access Network with Dynamic Base Station Energy Saving”, *ACM MobiCom.*Vol. 9. No. 262, 2009.

[9] Xiangchuan Gao , Zheng Zhou, Yuanyuan Zhang, Zhongyong Wang , Xingye Wang, “ Optimal power efficiency of spatial multiplexing in optical wireless MIMO channels” China (CHINACOM), 14-16 Aug. 2014 © IEEE.

[10] Saso Tomazic, Sreco Plevel , Tornaz Javornik and Gorazd Kandus , “MIMO: Wireless Communications”, Encyclopedia of Wireless and Mobile Communications DOI: 10.1081/E-EWMC-120043484.

[12]. D. Gesbert , M. Shafi , D. S. Shiu , P. Smith , A. Naguib, “From Theory to Practice: An overview of MIMO space-time coded wireless systems”, D. Gesbert acknowledges the support in part of Telenor AS, Norway, Dept of Electrical and Elec. Engineering University of Canterbury Christchurch, New Zealand.

[11] Yong Soo Cho , Jaekwon Kim ,Won Young Yang, G. Kang, “MIMO-OFDM WIRELESS” Includes bibliographical references and index. ISBN 978-0-470-82561-7.

[13] S´ebastien de la Kethulle , “An Overview of MIMO Systems in Wireless Communications”, International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.3, May 2012.