Evaluation of MIMO fading channels

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Abstract- Deployment of Wireless LAN increases well around the globe, it is increasingly important for us to understand different technologies and select the most appropriate one. MIMO channel also has been implemented and the throughput of the system has been calculated. As it known, wireless channels key problem is fading, in order to combat this fading and improve the capacity and the throughput of the system, multiple antennas at both ends of the communication link are used. This paper analysed the performance analysis of MIMO in fading envelope and helps in analysing the security and data rate of the channel.

Keywords – Wireless, MIMO, Fading, Channels.

I. INTRODUCTION

The development of wireless technologies has significantly changed our way of communicating and sharing information [1]. Easy access to networks is available at any time, and at any location, as long as we can build wireless connections among devices that are capable of transmitting and receiving signals in the open air. Wireless devices are usually allowed to move, while wireless connections can still be set up and maintained. Movement of devices and other objects in the propagation medium introduces dynamics in the connection quality of a wireless network. The connectivity may vary over time due to change of device location, moving speed, or time-varying interference in the area, etc.

The development of wireless communication systems for high-bit-rate data transmission and high-quality information exchange between terminals is becoming one of the new challenging targets in telecommunications research. The market demand for broadband multimedia services, ubiquitous networking, and Internet access via portable devices is expected to grow enormously, pushing the development of modem and system architectures for high-bit-rate transmission.

Multiple input multiple output (MIMO) systems are currently stimulating considerable interest across the wireless industry because they appear to be a key technology for future wireless generations. MIMO systems have been recently under active consideration because of their potential for achieving higher data rate and providing more reliable reception performance compared with traditional single-antenna systems for wireless communications [2, 3]. A space-time (ST) code is a bandwidth-efficient method that can improve the reliability of data transmission in MIMO systems [4]. It encodes a data stream across different transmit antennas and time slots, so that multiple redundant copies of the data stream can be transmitted through independent fading channels. By doing so, more reliable detection can be obtained at the receiver. General configuration of a MIMO communication system is shown in figure 1.

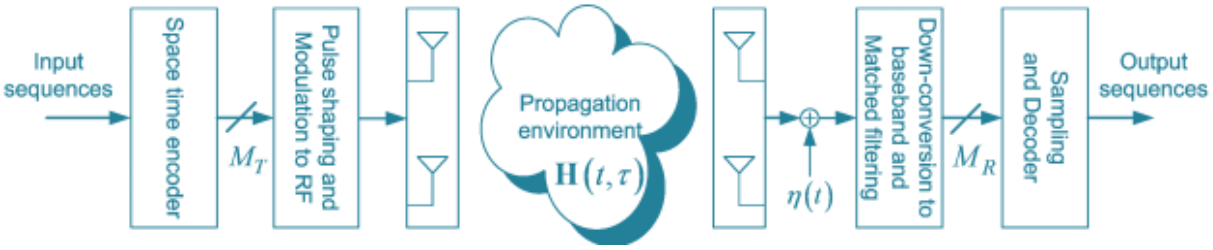

Figure 1. General Configuration of a MIMO

II. LITERATURE REVIEW

Rahul P. Bhoyar et al. [5] in 2013 discussed that wireless Communication is an application of science and technology that has come to be vital for modern existence. From the early radio and telephone to current devices such as mobile phones and laptops, accessing the global netwpork has become the most essential and indispensable part of our lifestyle. Wireless Local Area Network is a data transmission system considered to provide location independent network access between computing devices by using radio waves rather than a cable infrastructure. In the business venture, wireless LANs are frequently employed as the final link between the existing wired network and a group of client computers, giving these users wireless access to the full resources and services of the corporate network across a building or campus setting. The 802.11 is a family of specifications developed by the IEEE for WLANs. The IEEE 802.11 standard supports radio transmission within the 2.4 GHz band. In this paper, we concern on different WLAN standards and their comparative study on standard 802.11 a/b/g/n which will help to WLAN user's , student and researcher's for selection of better type of WLAN standard.

Arashpal Chahal et al. [6] in 2015 discussed that increasing demand for high-performance 4G broadband wireless is enabled by the use of multiple antennas at both base station and subscriber ends. Multiple antenna technologies enable high capacities suited for Internet and multimedia services, and also dramatically increase range and reliability. However, in fast fading channels, the time variation of a fading channel over an OFDM symbol period results in a loss of sub-channel orthogonality, which leads to inter-carrier interference (ICI). In this paper, introduce an orthogonal spatial division multiplexing in which divide the central signal streams into both time and frequency. Also to increase the spatial diversity we are going to introduce spatial modulation along with STBC for our new MIMO-OSDM. Experimental results show that, proposed system outperform the existing MIMO-OFDM system in terms of bit and symbol error rate for various modulation schemes.

Xiaohui Wang [1] in 2014 discussed that wireless research and development requires effective and efficient simulation and emulation tools to validate and evaluate wireless designs. Wireless channel models are used in the tools to simulate signal propagation properties in the real physical world. However, due to practical issues, these models are often too generalized and simplified in large scale experiments, and they only provide limited realism. In this, a novel world model is proposed for simulation and emulation of wireless networks. The proposed model includes the design and implementation of a variety of environment models that enhance realism in simulation. These models capture realistic signal propagation properties across multiple connections, and over time: first, the impact of realistic physical world features, such as channel dynamics and cross link correlation are characterized at different time scales; then, both geometrical and statistical simulation models are developed to recreate desired channel dynamics among wireless network links efficiently.

Shanar H. Askar [7] in 2010 discussed that a radio channel characteristic modeling is essential in every network planning. This deals with the performance of WiMax networks in an outdoor environment while using fading channel models. The radio channels characteristics are analyzed by simulations have been done using Matlab programming. Stanford University Interim (SUI) Channels set was proposed to simulate the fixed broadband wireless access channel environments where IEEE 802.16d is to be deployed. It has six channel models that are grouped into three categories according to three typical different outdoor Terrains, in order to give a comprehensive study of fading channels on the overall performance of the system, WiMax system has been tested under SUI channels that modified into account for 300 directional antennas, with 90% cell coverage and with 99.9% reliability in its geographical covered area. Furthermore, in order to combat the fading which occurs in urban areas and improve the capacity and the throughput of the system, multiples antennas at both ends of communication link are used, the transmission gain obtained when using multiple antennas instead of only a single antenna. Space-time coding and maximum ratio combining for more than one transmit and receive antenna is implemented to allow performance investigations in various MIMO scenarios. It has been concluded that uses multiple antennas at the receiver offers a significant improvement of 3 dB of gain in the channel SNR.

Dr. R K Bansal et al.[8] in 2010 discussed that the wired Computer Networks provide a secure and faster means of connectivity but the need of mobility i.e. anywhere, anytime and anyone access is tilting the network users towards wireless technology. In this paper, an overview of the current research literature, in the field of Wired and wireless networks, has been presented. The network simulators provide an ease in predicting and estimating the performance of networks. Among the various network simulators available, OPNET gains an edge in analysing the performance of the networks through simulations. The metrics like throughput, delay and retransmission attempts have been overviewed for performance analysis of the wireless and wired computer networks using soft computing techniques like simulation through OPNET.

Ahmed M. Al Naamany et al. [9] in 2006 discussed that the Wireless Local Area Networks (WLANs) are cost effective and desirable gateways to mobile computing. They allow computers to be mobile, cable less and communicate with speeds close to the speeds of wired LANs. These features came with expensive price to pay in

areas of security of the network. This paper identifies and summarizes these security concerns and their solutions. Broadly, security concerns in the WLAN world are classified into physical and logical. The paper overviews both physical and logical WLANs security problems followed by a review of the main technologies used to overcome them. It addresses logical security attacks like manin-the-middle attack and Denial of Service attacks as well as physical security attacks like rouge APs. Wired Equivalent Privacy (WEP) was the first logical solution to secure WLANs. However, WEP suffered many problems which were partially solved by IEEE802.1x protocol. Towards perfection in securing WLANs, IEEE802.11i emerged as a new MAC layer standard which permanently fixes most of the security problems found in WEP and other temporary WLANs security solutions. This paper reviews all security solutions starting from WEP to IEEE802.11i and discusses the strength and weakness of these solutions.

III.CONCLUSION

Wireless Communication is an application of science and technology that has come to be vital for modern existence. From the early radio and telephone to current devices such as mobile phones and laptops, accessing the global network has become the most essential and indispensable part of our lifestyle. Wireless communication is an ever-developing field, and the future holds many possibilities in this area. Deployment of Wireless LAN increases well around the globe, it is increasingly important for us to understand different technologies and select the most appropriate one. We developed an analytical framework for the performance analysis of multiple-input-multiple output (MIMO) systems subject to co-channel interference and operating over fading channels.

REFERENCES

[1] Xiaohui Wang (2014), “Environment Models for Realistic Simulation and Emulation of Wireless Networks”.

[2] R. D. Murch and K. B. Letaief(2002), “Antenna Systems for Broadband Wireless Access”, ‖ IEEE Commun. Mag., vol. 40, pp. 76‐83.

[3] S. N. Diggavi et al. (2004), “Great Expectations: the Value of Spatial Diversity in Wireless Networks”, ‖ Proc. IEEE, vol. 92, no. 2, pp. 219‐70.

[4] S. M. Alamouti(1998), “A Simple Transmit Diversity Technique for Wireless Communication”, ‖ IEEE JSAC, vol. 16, pp. 1451‐58.

[5] Rahul P. Bhoyar, Mangesh M. Ghonge and Suraj G. Gupta(2013), “Comparative Study on IEEE Standard of Wireless LAN/ Wi-Fi 802.11 a/b/g/n”, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume 2, Issue 7.

[6] Arashpal Chahal, Amandeep Kaur and Ranjeet Singh(2015), “An Adaptive MIMO-OSDM Prototype for Next Generation Communication Systems under fading Channels”, International Journal of Engineering Research and General Science, Volume 3, Issue 1.

[7] Shanar H. Askar(2010), “Performance Evaluation of Fixed WiMax Physical Layer under High Fading Channels”.

[8] Dr. R K Bansal, Vikas Gupta and Rahul Malhotra (2010), “Performance Analysis of Wired and Wireless LAN Using Soft Computing Techniques- A Review”, Global Journal of Computer Science and Technology Vol. 10 Issue 8 Ver.1.0.

[9] Ahmed M. Al Naamany , Ali Al Shidhani, Hadj Bourdoucen(2006), “IEEE 802.11 Wireless LAN Security Overview”, IJCSNS International Journal of Computer Science and Network Security, Vol.6 No.5.