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PROVISION OF NOMA FOR 5G

Ms. Shital Shivaji Pawar, Assistant Professor, Dept. Of Electronics and Telecommunication, SVERI'S College, Solapur University.

Abstract

Mobile Internet and connected devices, offering a variety of services at different levels of performance, represents a major challenge for the fifth generation of wireless networks and beyond. This requires a paradigm shift toward the development of key enabling techniques for the next generation wireless networks. In this respect, NOMA (Non orthogonal multiple access) has recently emerged as a new communication paradigm to provide ubiquitous connectivity in radio frequency communications. The key feature of NOMA is to serve multiple users at the same time/frequency/code, but with different power levels, which yields a significant spectral efficiency gain over conventional orthogonal multiple access.

Keywords: **NOMA, spectral efficiency, frequency reuse.**

I. Introduction

NOMA Spectral Efficiency, Frequency Reuse. In wireless communications, multiple access techniques are essential to support multiple services for multiple users simultaneously. Orthogonal Multiple Access (OMA) techniques such as B. B-Time Domain Multiple Access (TDMA), Orthogonal Domain Multiple Access (OFDMA) and Frequency Interleaved Multiple Access (IFDMA) have been introduced in wireless communications. However, they suffer from a trade-off between bandwidth and fairness. Recently, non-orthogonal multiple access (NOMA), a new multiple access strategy, has received much attention. Unlike traditional multiple-access technologies, NOMA overlays user data in the power domain and uses Sequential Interference Cancellation (SIC) at the receiver (Rx) to separate user data, allowing all users to share frequency resources at all times. This allows NOMA to balance bandwidth and fairness. This was seen as a promising solution to increase the spectral efficiency of the fifth generation (5G) wireless network. With good practicability and good performance, has also been adopted in wireless communication systems.

II. Problem Statement

To enhance the spectral efficiency of the available RF spectrum by adopting advanced Modulation scheme Non- orthogonal Multiple Access (NOMA) which makes efficient bandwidth reuse.

III. Objectives

The objective of the proposed system is given below.

- Implementation of cooperative NOMA.
- Implementation of Non-cooperative NOMA.

IV. Literature

The issue and the earlier methods of detecting smart cities aredescribed in literature.

[1] Y. Saito, Y. Kishiyama, A. Benjebbour, T. Nakamura, A. Li, and K. Higuchi, "Non- orthogonal multiple access (NOMA) for cellular future radio access," in Proc. IEEE Vehicular Technology Conference, Dresden, Germany, Jun. 2013.

In this paper Non-orthogonal multiple access (NOMA) is one of the promising radio access techniques for performance enhancement in next-generation cellular communications Compared to orthogonal frequency division multiple access (OFDMA), which is a well- known high-capacity orthogonal multiple access (OMA) technique, NOMA offers a set of desirable benefits, including greater spectrum efficiency. There are different types of NOMA techniques, including power-domain and code-domain .

[2] Panagiotis D. Diamantoulakis, Koralia N. Pappi, "Wireless Powered Communications with Non-Orthogonal Multiple Access" et.al In this context, we provide a comprehensive overview of the state-of-the-art in power-domain multiplexing aided NOMA, with a focus on the theoretical NOMA principles, multiple antenna aided NOMA design, on the interplay between NOMA and cooperative transmission, on the resource control of NOMA, on the co- existence of NOMA with other emerging potential 5G techniques and on the comparison with other NOMA variants et.al.

[3] Zhiguo Ding, Robert Schober, "Survey on Non- Orthogonal Multiple Access for 5G Networks: Research Challenges and Future Trends" et.al. This survey provides an overview of the latest NOMA research and innovations as well as their applications. Future research challenges regarding NOMA in 5G and beyond are also discussed .

[4] S.M. Riazul Islam, Nurilla Avazov, "Power Domain Non- Orthogonal Multiple Access Techniques in 5G system: Potentails and Challages" et.al.

This paper deals with Non-Orthogonal Multiple Access (NOMA), a 5G multiple access technique. The main focus is on how the Bit Error Rate is varying with different Doppler Shifts and Transmit Antenna Diversity ignoring the Successive Interference Cancellation (SIC) at the receiving end. The key idea of NOMA is to use power domain for multiple access along with code domain multiplexing.

V. System Design

The difference between 3G, 4G and 5Gis that Compared to CDMA and OFDM, NOMA applies orthogonal transmission between sub channel, so the

near-far problem is not as much as it in 3G, and multiple access interference problems is not that serious as well. Because it is not depending on the users' feedback CSI, when applying AMC and power multiplexing techniques, it could easily deal with variable links, even under a fast-moving environment, it can still keep good speed performance. More importantly, NOMA allow one sub channel can be shared by multiple users, under the same transmit rate, it can definitely increase the spectrum efficiency compare with 4G. In the light of the research published by some of the world's leading research organizations, the spectrum efficiency will be one of the key points of 5G. From this point of view, NOMA, which can not only satisfy the mobile service speed demand but also enhance the spectrum efficiency, is likely to be adopted as the new multi-access technology in 5G.

Proposed Work: Non-cooperative NOMA Cooperative NOMA In the simulation environment the encoding technique used is the superposition coding. Two or more signals which are being transmitted are superimposed on each other and then transmitted through the physical downlink channel. QPSK and 16 QAM modulation techniques are used. Additive White Gaussian Noise is added to the channel. Now at the receiving end the signals are demodulated and decoded. The decoding technique is Successive Interference Cancellation (SIC) in general but here it could be sphere decoder ignoring SIC. The key features of NOMA include increase in spectral efficiency, massive connectivity and low transmission latency and cost of signaling. In the pioneer work the multi-user capacity in NOMA is preferable to Orthogonal Multiple Access (OMA). Power Allocation: Fig. 4.1 shows the antenna transmits the unipolar real signals x1 and x2 to U1 and U2, respectively. Since U2 is closer to the transmitting and thus has a higher channel gain, the access point assigns a lower power level to x2. The two signals are then superimposed and transmitted simultaneously as s= P1x1 + P2x2, where P1 >P2 and the sum of these assigned power values is equal to the total transmitting power. The same principle applies for a higher number of users, where the allocated power values are determined based on the channel gains of the different users. Successive Interference Cancellation (SIC): The dominant component in the combined received signal in Fig. 4.1 is P1x1 U1can directly decode its signal considering the interference from the other user's signal as noise, U2, however, needs to decode x1 first, and then subtract it from the combined

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signal in order to isolate x2 from the residue. This process is called SIC (signal interference cancellation), where users are ordered according to their respective signal strengths so that each receiving terminal decodes the strongest signal first, subtracts it, and repeats the process until it decodes its desired signal

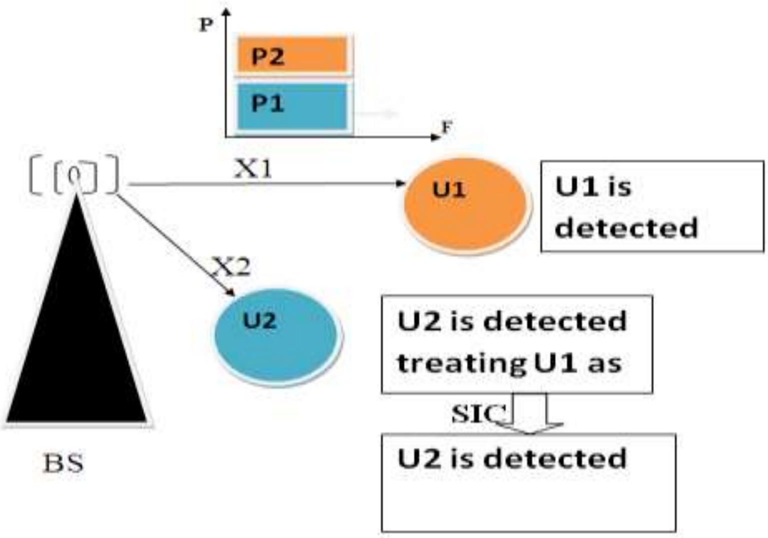

Fig2.Diagram of planned design

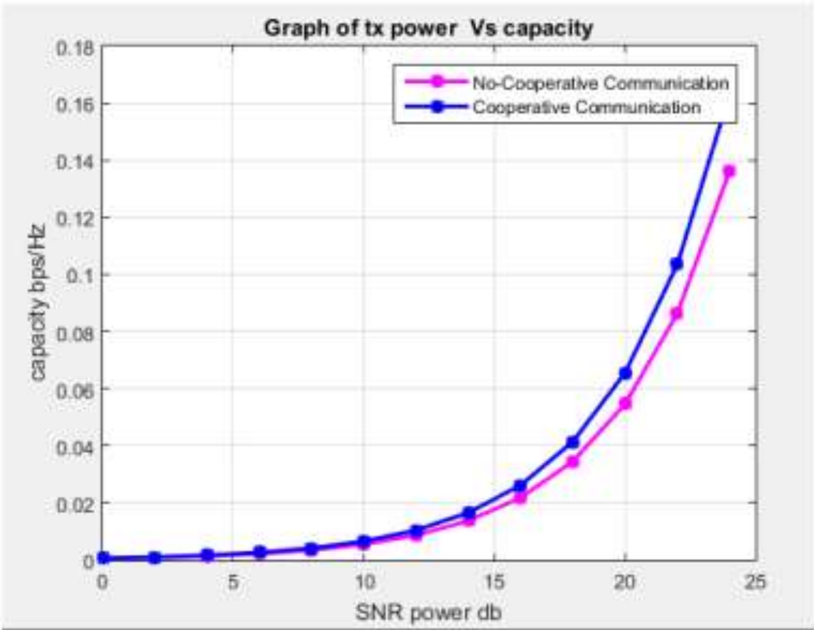

Fig3:- capacity comparison of Cooperative NOMA and Non Cooperative NOMA

Above result shows the capacity in terms of bits per sec increased as shown in fig 2 that is in OMA we are assigning different frequency to different user but in NOMA we can serve different user in single frequency.

That mean we can serve number of users in single frequency which will result in incensed spectral efficiency

I. ADVANTAGES

- Capacity is increased in bits/Hz
- It serves more no of users in single frequency

- Due to which spectral efficiency increased

II. LIMITATIONS

- Receiver complexity is high

VI. Conclusion

This synopsis presents an overview of the proposed system which is the emerging concept of power-domain Non- othogonal Multiple Access (NOMA) and its integration in Wireless network and the data rate is increased with use of single frequency this system serving number of user.

NOMA schemes are proposed to improve the efficient usage of limited network sources. OMA based approaches that use time, frequency, or code domain in an orthogonal manner cannot effectively utilize radio resources, limiting the number of users that can be served simultaneously. In order to overcome such drawbacks and to increase the multiple access efficiency, NOMA technique has been recently proposed. Accordingly, users are separated in the power domain. Such a power-domain based multiple access scheme provides effective throughput improvements, depending on the channel conditions. In OMA, differences between channels and conditions of users cannot be effectively exploited. It is quite possible for a user to be assigned with a large frequency band while experiencing deteriorating channel conditions. Such user cases limit the effectiveness of OMA based approaches. However, according to the NOMA principle, other users who may be experiencing better channel conditions can use these bands and increase their throughput. Moreover, corresponding users who are the primary users of these bands continue to use these bands. In such deployments, power level of users is selected in a way to target a certain maximum error rate. Furthermore, the performance of NOMA can be significantly improved using MIMO and cooperative communication techniques.

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