A NOVEL APPRROACH FOR POWER AND HANDOFF OPTIMIZATION IN INTRA AND INTER CELLULAR REGIONS FOR NEXT GEN CELLULAR NETWORKS

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Abstract- The rapid increase in the number of subscribers demanding high data rate applications has resulted in maturing of the 4G networks. The next generation (5G) wireless communication networks (WCNs) are required to fulfill these rising requirements, hence aiming to utilize the available spectrum as efficiently as possible. Network densification is regarded as one of the important ingredients to increasing capacity for next-generation mobile communication networks. However, it also leads to mobility problems since users are more likely to hand over to another cell in dense or even ultra-dense mobile communication networks. Therefore, supporting seamless and robust connectivity through such networks becomes a very important issue. In this project, we investigate handoff optimization and power optimization in next-generation mobile communication networks. We propose a data-driven handoff optimization approach, which aims to mitigate mobility problems including too-late Handoff, too-early Handoff, and unnecessary Handoff. Various technologies such as massive MIMO, spectrum sharing, device-to-device communication (D2D), have gained significant attention in aiding spectrum utilization along with power optimization.

Index Terms -OFDM framework, MIMO, Data driven handoff approach, Small cell network

I. INTRODUCTION:

In the last decade, technologies have rapidly developed towards providing better, faster, and reliable communications amongst people and devices. The use of internet in our daily life has taken a big leap from being a luxury to a necessity. Alongside that, the use of traditional desktop devices has evolved to the use of portable and hand-held devices. These changes in user behaviour and level of device mobility have led to a surge in telephony and internet activity on the go. Previously, mobile telephony and fixed line internet services had separate revenue markets and distinct business plans, however, recently the market has unfolded to unified Quality of Experience (QoE) based service to the end user. This continuing growth in demand for better wireless broadband experience is forcing the industry to look ahead at how the current networks can be readied to fulfil the future demands.

Future 5th generation (5G) networks are expected to be capable of providing significantly high capacity, compared to the previous generations of mobile communication systems to meet increase demand. In the interest of handling high data rate demands and providing a complete service structure to end users, mobile operators have invested into various solutions. Similarly, the research community have also proposed several techniques to handle Hot-spots. Deployment of heterogeneous Networks (HetNets), comprising of large cells and densely deployed small-cells, is suggested as a promising solution for future 5G networks. Dense deployment of small-cells overlayed within the area of larger macro-cells has the potential to provide higher spectral efficiency, as compared to Wi-Fi offloading and Massive Multiple-Input Multiple-Output (MIMO) systems.

II. LITERATURE SURVEY AND EXISTING SYSTEM

The existing 4G communication system has a few drawbacks that impact its performance and efficiency. One of the main issues is the use of isotropic antennas, which result in high power wastage. Additionally, the available spectrum is not utilized properly by existing mobile users. These two issues are major concerns in designing future wireless networks.

Another significant challenge with the current system is the increasing number of mobile users, which leads to handoff problems as users move across cells. This often results in frequent call dropouts, which negatively impacts user experience and satisfaction.

In summary, the existing 4G communication system suffers from several significant disadvantages that limit its performance and efficiency. These include high power wastage due to the use of isotropic antennas, poor utilization of available spectrum, and challenges associated with handoffs and call dropouts as the number of mobile users continues to increase. These drawbacks must be addressed in the design of future wireless networks to ensure optimal performance and user experience.

III. PROPOSED WORK

The existing 4G communication system suffers from a major drawback in the form of power wastage due to the use of conventional isotropic antennas. To address this issue, this paper proposes the use of directional antennas instead of isotropic antennas in the 4G communication system. Directional antennas radiate their power in a particular direction, resulting in maximum power delivery in that direction and reducing power wastage. This approach helps optimize power usage without increasing power levels, resulting in efficient use of available resources. Additionally, this paper proposes the deployment of a base transceiver station (BTS) in each small cell of a geographic location. Each BTS radiates energy in a particular direction with the help of directional antennas, and mobile users connect to the BTS with the strongest signal. This approach optimizes power usage while ensuring that mobile users have the strongest and most reliable signal.

Another objective of this paper is to provide proper handoff facilities to mobile users as they move across cells. To achieve this objective, a data-driven handoff approach is proposed. This approach tracks the location of mobile users and updates the Mobile Telephone Switching Office (MTSO) about their location. Through MTSO, a proper handoff mechanism is provided, which prevents handoff mobility problems and ensures seamless communication for mobile users.

To further optimize the use of available spectrum, this paper proposes the use of multiplexing techniques such as Orthogonal Frequency Division Multiplexing (OFDM) and Multiple Input Multiple Output (MIMO) frameworks. These techniques can efficiently allocate and utilize the available spectrum, resulting in enhanced communication and data transfer rates.

In summary, this paper proposes a new approach to address the major drawbacks of the existing 4G communication system. By replacing isotropic antennas with directional antennas and deploying BTS in each small cell of a geographic location, power wastage can be significantly reduced, and mobile users can have a more reliable and stronger signal. The proposed data-driven handoff approach ensures proper handoff facilities, preventing handoff mobility problems. Multiplexing techniques such as OFDM and MIMO frameworks efficiently allocate and utilize the available spectrum. This proposed system offers significant advantages over the existing system, resulting in a more efficient and reliable 4G communication system.

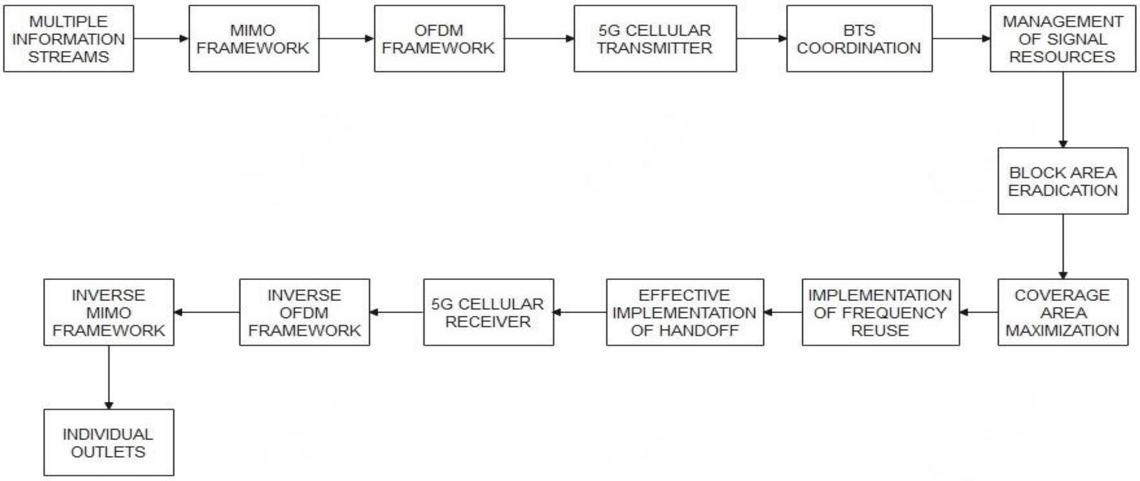


Fig: Schematic Block Diagram of the Proposed System

In the case of the mobile communication system, the block diagram consists of various stages that enable the transmission and reception of signals between mobile users and the cellular network. The first stage involves the collection of multiple signals from different mobile users. These signals are then transmitted through the Multiple-Input Multiple-Output (MIMO) framework. MIMO allows for the use of multiple antennas for transmitting and receiving signals, which enables better performance in terms of data rate, spectral efficiency, and signal quality.

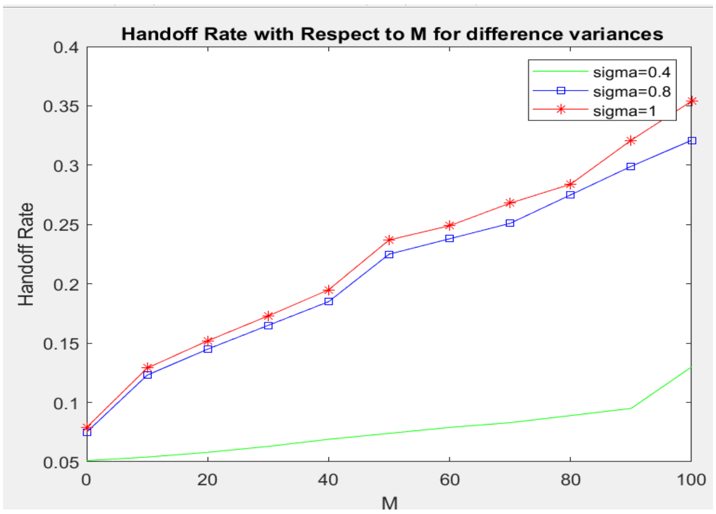
The next stage involves the use of Orthogonal Frequency Division Multiplexing (OFDM) technique to multiplex the information. OFDM divides the transmission into several subcarriers that are orthogonal to each other. This division enables the transmission of high-speed data over a channel with varying signal quality.

The output of this process is an OFDM frame that is transmitted through the 5G cellular transmitter. This transmitter is connected to the Base Transceiver Station (BTS) of the individual small cell. The BTS is responsible for radiating the signals throughout the cell.

Proper management of available system resources is essential for maximizing the coverage area and eliminating the block areas where there is no signal coverage. Frequency reuse is implemented to improve the coverage and capacity of the system. The system also provides a proper handoff facility to the mobile users who are moving across the cells.

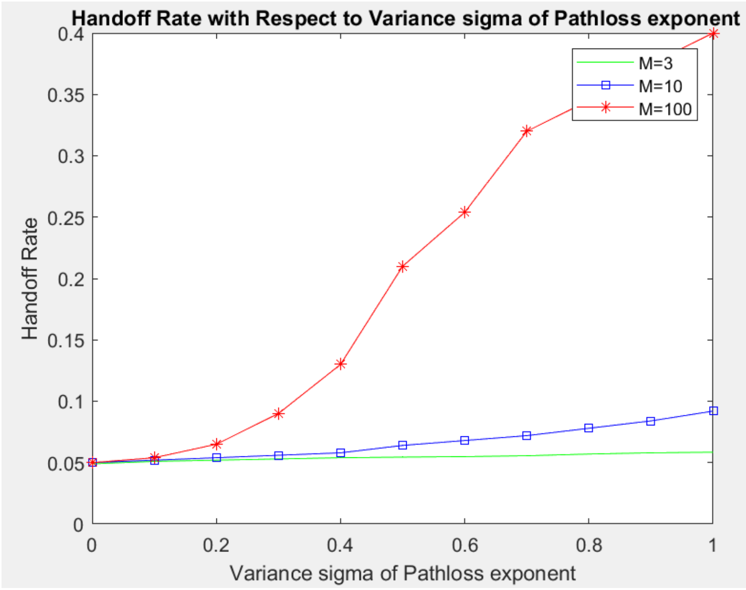
At the receiver side, the inverse OFDM and inverse MIMO frameworks are used to reconstruct the original signal. The reconstructed signal is then passed to individual outlets for use by the mobile users.

IV. RESULTS AND DISCUSSION



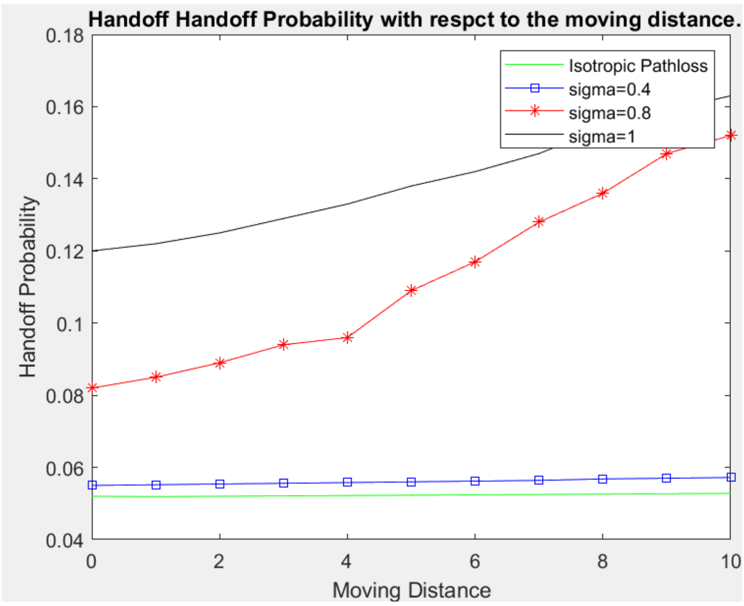
Fig(a):Handoff rate w.r.t number of users for different variances

The above figure(a) shows the variation of handoff rate with respect to the number of mobile users for different sigma values. Here, sigma indicates the type of handoff, and when sigma equals 0.4, there is no proper signal strength, and the unavailability of the user's location results in an early handoff decision, which refers to "too early handoff", and 0.8 indicates "too late handoff" However, when sigma equals 1, accurate handoff is present, and the user's location is accurately known, so the handoff should be done accurately.



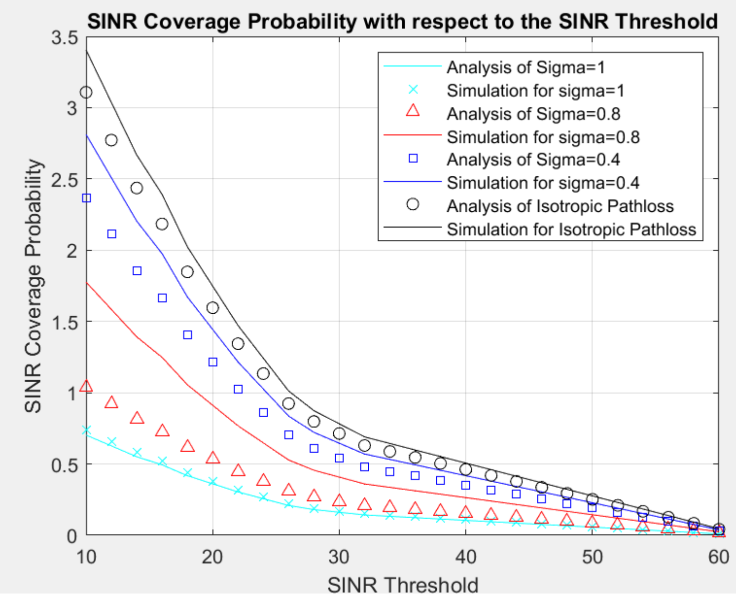
Fig(b):Handoff rate w.r.t pathloss exponent

The above figure(b) show that the handoff rate will vary due to the interference caused by co-channel and inter-channel interference. The mobile equipment signal will fluctuate due to this interference, which can result in MTSO not being able to make the correct handoff decision for the users.



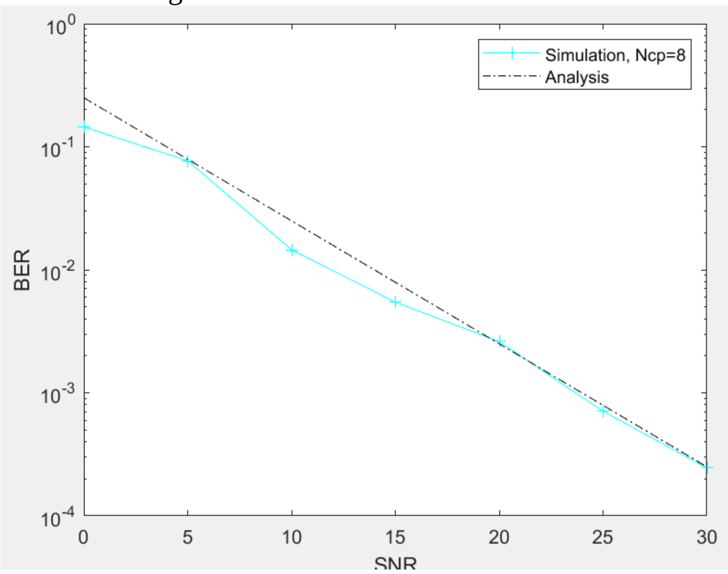
Fig(c):Handoff rate w.r.t moving distance

The above figure(c)shows the handoff probability, which refers to the chance of successfully completed handoff requests with respect to the moving distance. Here, when a high sigma value is present, the handoff probability is also high because of the good signal strength.

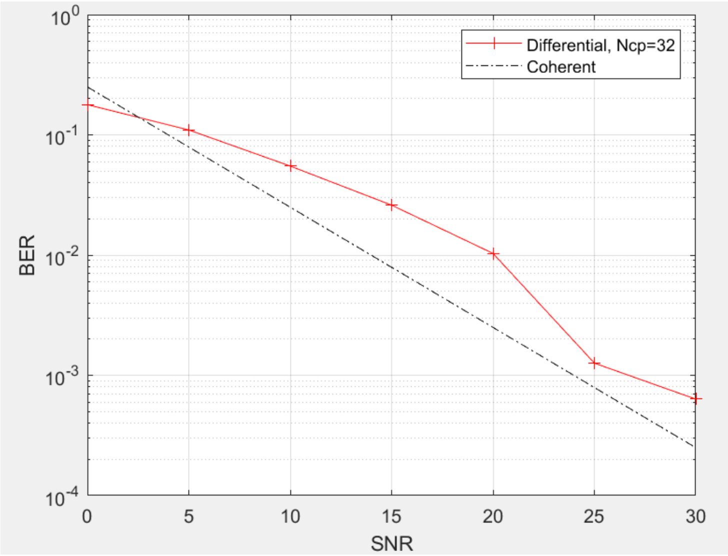


Fig(d):SINR Coverage Probability

The above figure(d) indicates that the y-axis represents interference losses. When the sigma value is high, the losses are also high, which in turn increases the coverage area.



Fig(e):BER vs SNR



The above figures(d,e) indicate the performance of 5g fractal small cell network communication system performance in terms of BER and SNR

CONCLUSIONS

The proposal presented aims to achieve joint spectrum efficiency and energy efficiency for the NGN's utilizing spectrum sharing. The model validates its performance when compared to the conventional opportunistic spectrum sharing approach and other popular resource allocation schemes. Significant improvement in the QoS and throughput has been observed in the system when Hidden Markov model is used in the proposed model. Spectrum Sharing is highly susceptible to jamming attack along with interference and coverage management issues, which remains an open research field. The small cell network is a promising technology for 5G mobile communication systems to increase the network capacity. Considering the complex environment in urban scenarios, the anisotropic path loss effect cannot be ignored any more. A multi-directional path loss model was proposed to analyze the impact of the anisotropic path loss exponent on performance in 5G fractal small cell networks. The new coverage probability, association probability and handoff probability were derived based on the proposed multi-directional path loss model.

REFERENCES

[1] M. Agiwal, A. Roy, and N. Saxena, "Next generation 5G wireless networks: a comprehensive survey," IEEE Commun. Surveys & Tutorials, vol. 18, no. 3, pp. 1617–1655, Feb. 2016

[2] J. Shi, L. Lv, Q. Ni, et al., "Modeling and analysis of point-to-multipoint millimeter-wave backhaul networks," IEEE Trans. Wireless Commun., publication online, DOI: 10.1109/TWC.2018.2879109.

[3] W. Roh et al., "Millimeter-wave beamforming as an enabling technology for 5G cellular communications: Theoretical feasibility and prototype results," IEEE Commun. Mag., vol. 52, no. 2, pp. 106–113, Feb. 2014

[4] A. V. Alejos, M. G. Sanchez, and I. Cuinas, "Measurement and analysis of propagation mechanisms at 40 GHz: Viability of site shielding forced by obstacles," IEEE Trans. Veh. Technol., vol. 57, no. 6, pp. 3369–3380, Nov. 2008

[5] T. S. Rappaport, W. Roh and K. Cheun, "Mobile's millimeter-wave makeover," IEEE Spectrum, vol. 51, no. 9, pp. 34–58, Sept. 2014

[6] X. Ge, L. Pan, Q. Li, et al., "Multi-Path Cooperative Communications Networks for Augmented and Virtual Reality Transmission," IEEE Trans. Multimedia, vol. 19, no. 10, pp. 2345–2358, Oct. 2017

[7] Y. Zhong, X. Ge, H.-H. Yang, et al., "Traffic Matching in 5G Ultra-dense Networks," IEEE Commun. Mag., vol. 56, No.8, pp. 100–105, Aug. 2018

[8] V. Naghshin, M. C. Reed, and N. Aboutorab, "Coverage analysis of packet multi-tier networks with asynchronous slots," IEEE Trans. Commun., vol. 65, no. 1, pp. 200–215, Jan. 2017

[9] H. S. Dhillon, R. K. Ganti, and J. G. Andrews, "Load-aware modeling and analysis of heterogeneous cellular networks," IEEE Trans. Wireless Commun., vol. 12, no. 4, pp. 1666–1677, Apr. 2013

[10] C. H. Liu and K. L. Fong, "Fundamentals of the downlink green coverage and energy efficiency in heterogeneous networks," IEEE J. Select. Areas Commun., vol. 34, no. 12, pp. 3271–3287, Dec. 2016