JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

An Efficient Approach for Cooperative Energy Efficiency Maximization Algorithm in 5G Ultra-Dense Networks

[1]Prakash Singh, [2]Prof. Santosh Kumar
[1]M.Tech Scholar, [2]Assistant Professor
[1&2]Department of Electronics and Communication Engineering
[1&2]Millennium Institute of Technology and Science, Bhopal, India

Abstract : The fifth generation (5G) mobile communication systems are facing novel challenges due to promising mobile Internet and Internet of Things applications. 5G should be with both spectrum efficiency (SE) and energy efficiency (EE). Increasing network densification is regarded as one of the powerful ways to jointly enhance them in a cost-effective manner. This paper proposes an efficient approach for cooperative energy efficiency maximization algorithm in 5G ultra-dense networks. The simulation results show that the spectral efficiency and energy efficiency are improved. The numerical results are verifying using MATLAB simulations.

IndexTerms **- 5G, SE, EE, Interference, Ultra-Dense, Wireless, Communication, Energy, Spectrum, Efficiency.**

I. INTRODUCTION

The fifth era (5G) mobile correspondence frameworks are confronting novel difficulties because of promising mobile Web and Web of Things applications. 5G ought to be with both spectrum efficiency (SE) and energy efficiency (EE). Expanding network densification is viewed as one of the powerful approaches to mutually upgrade them in a financially savvy way. Notwithstanding, ultra-dense sending of little cells likewise presents novel specialized difficulties, e.g., the interference. So as to keep away from the interference and increment the SE, some helpful perceptions of interference the executives were accounted for in, e.g., the more sporadic and denser sending of little cells, the higher additions in interference alleviation. Nonetheless, the interference and green plan issues in the ultra-dense networks are getting more mind boggling because of the inborn densification and versatility. On one hand, ultra-dense little cells underlay the macro cell, which presents complex interference. It is difficult to examine the intuitive practices and vital dynamic among various little cell eNBs (SeNBs)[2].

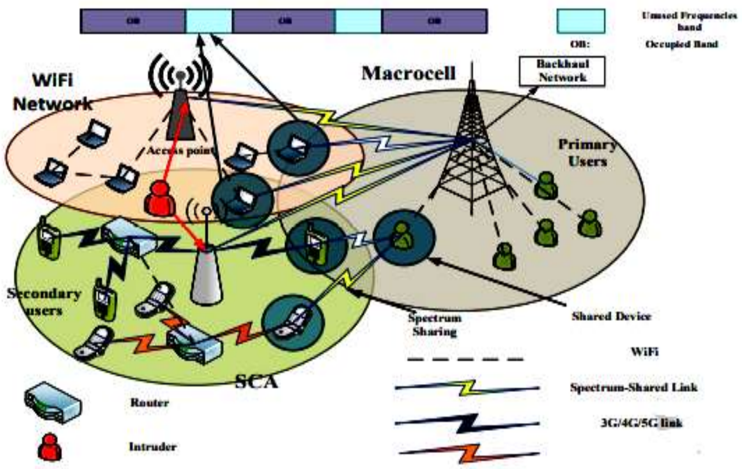

Figure 1: Ultra dense network

In the interim, the versatility is additionally testing in explicit hotspots. Then again, appropriated asset the board and interference control will be more powerful in ultra-dense networks. Be that as it may, the flagging overhead will consistently be high, which difficulties and weights the backhaul of the networks. Not quite the same as the current examination on interference moderation by improving the SE execution just, in this work, we study the EE maximization issue by investigating and abusing different cooperative variety gains. To start with, it is realized that the denser the little cells are, the more cooperative variety additions can be investigated to alleviate interference, consequently improving the SE and the EE execution. Second, to investigate the inherent attributes of ultra-dense networks, game hypothesis can well portray the intelligent practices and vital dynamic among various little cell players. In the interim, game hypothesis likewise encourages the plan of disseminated asset the executives and interference control. To describe the cooperative practices, we go to the dealing cooperative games. The principle commitments are summed up as follows:

We execute the mean field way to deal with describe and alleviate the perplexing interference impact. This methodology can be applied in the ultra-dense networks with simpler examination of the connection between the EE and the SE. With the known interference situation, we give shut structure connections between the SE and the EE in various cases [8].

II. PROPOSED METHODOLOGY

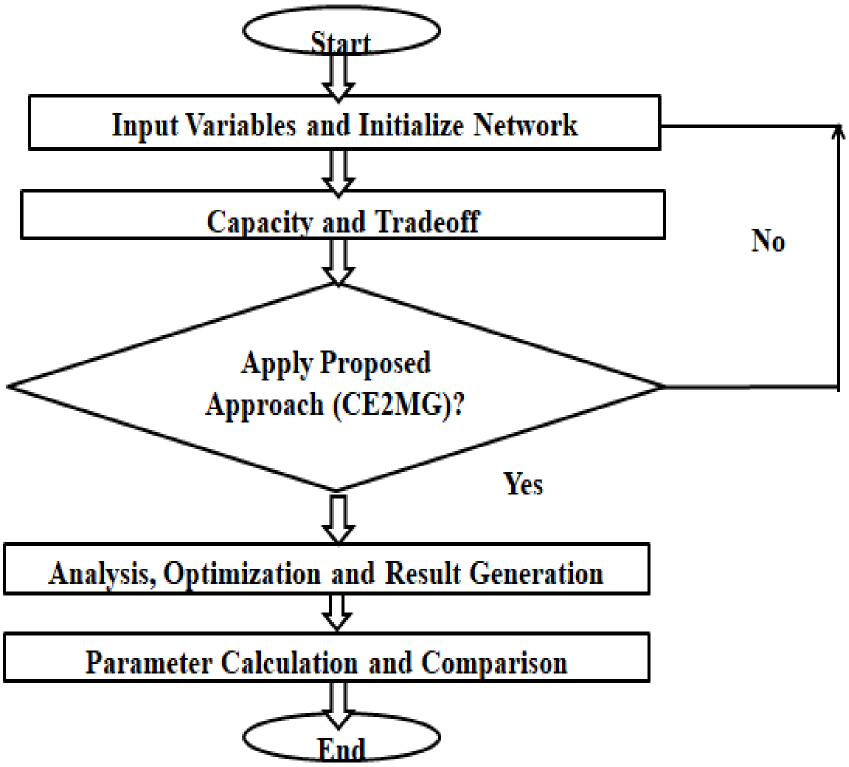

Figure 2: Flow Chart

Cooperative Energy Efficiency Maximization Game (CE2MG)

Implement Define a cooperative energy productive maximization game (CE2MG) show and propose a circulated CE2MG calculation to accomplish the ideal SE arrangement of every player expanding framework EE. Bartering based cooperative game can ensure the presentation of both the efficiency and the reasonableness among various SeNBs.

It is realized that the ideal Nash cooperative bartering arrangement (NBS)- based control will accomplish an ideal tradeoff between Nash reasonableness and Nash aphoristic efficiency under the system of Nash proverbial hypothesis, which has been checked in our past NBS-defined work. In rundown, the cooperative EE maximization game can be accomplished by taking care of the Nash-item issue where ' min 1 and ' min 2 are viewed as the contradiction focuses. By and large min 1 and' min 2 are set as the insignificant energy efficiency necessities of the taking an interest players. With these essential articulations of Nash haggling game of a two-player case, we characterize the L-player cooperative EE maximization game as follows.

The player's EE inclination with respect to the tradeoff among EE and SE as depicted. The ideal all out utility in the Nash-item structure characterized in the introduced (CE2MG) system ensures both the efficiency and the decency, which has been demonstrated. In the accompanying, we initially characterize the cooperative bartering arrangement of the CE2MG and explore its properties. We utilize the direct accomplished definition in game hypothesis to depict the balance practices.

III. SIMULATION RESULTS

The implementation of the proposed algorithm is done over MATLAB 9.4.0.813654 (R2018a). The communication toolbox helps us to use the functions available in MATLAB Library for various methods commands and function.

Table 1: System parameters

Sr. No	Parameters	Value
1	Simulation area	2000 X 2000 mm^2
2	Noise Power Spectrum Density	-180
3	Spectrum Bandwidth (w)	20 MHz
4	Number of SeNBs	600
5	Macrocell eNB	5

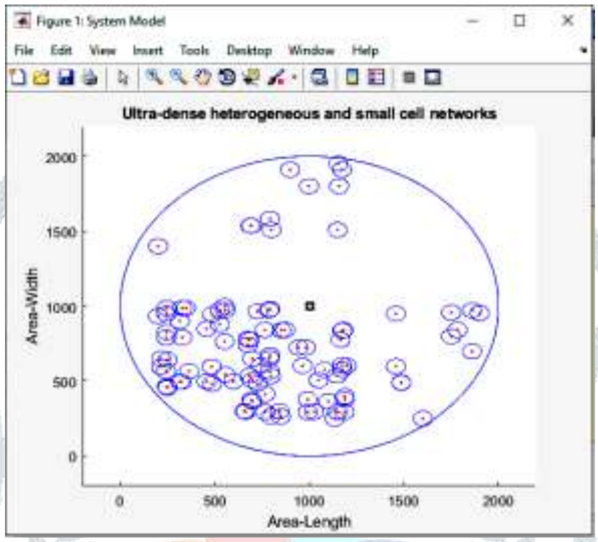

Figure 3: System model

The figure 3 is showing the system model, where 2000 X 2000 mm^2 area is taken. Interference in an UDN becomes more severe, with higher volatility, and there may be a large number of strong interferers but none dominant.

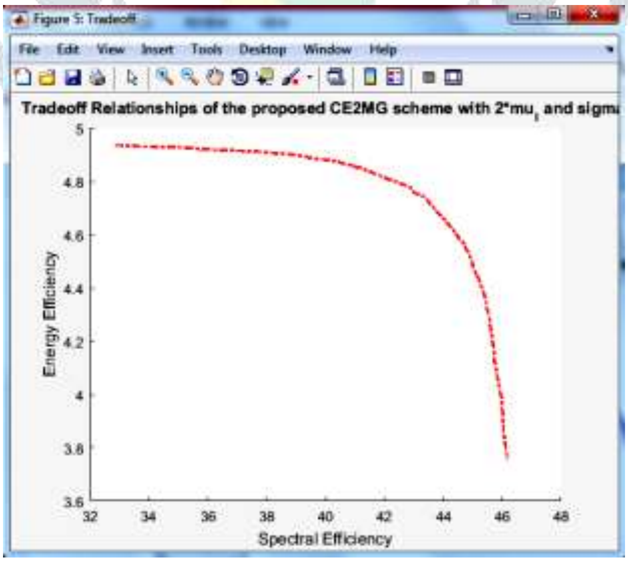

Figure 4: Tradeoff relationships of proposed CE2MG scheme with 2*mu1& sigma.

Figure 4 is showing the tradeoff relationships of the proposed CE2MG scheme with scheme with 2*mu1& sigma.

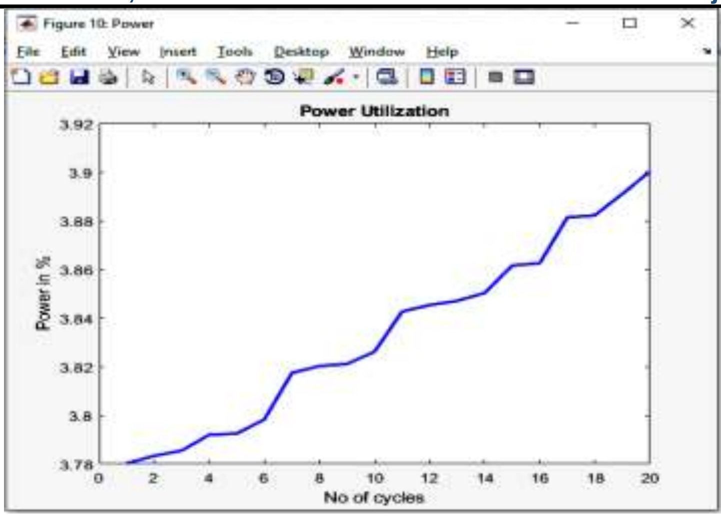

Figure 5: Power Saving

The figure 5 presents an energy management or power saving for heterogeneous UDG networks based on Cooperative EE maximization game (CE2MG). The proposed algorithm reduced power consumption. 3.92 W power is utilized so aprox 96% power is saving.

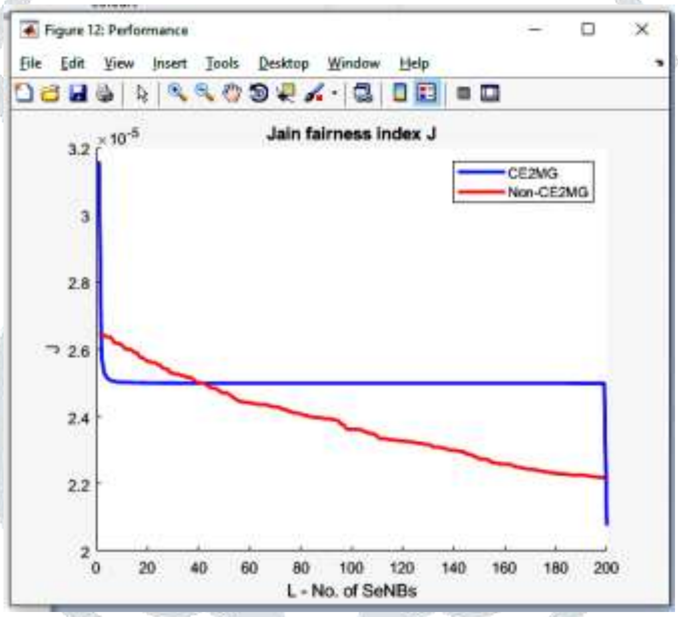

Figure 6: Jain's fairness index comparison

Figure 6 showing introduced CE2MG conspire and the Non-CE2MG plan will accomplish diminishing reasonableness because of the expanding number of little cells.

Table 2: Comparison of existing and proposed work

Sr No.	Parameters	Previous Work [1]	Proposed Work
1	Method	Graph Theory	Cooperative EE maximization game (CE2MG)
2	Power Saving	60%	97%
3	Number of nodes	10000	10000
4	Simulation Time	NA	4 Sec
5	Number of cycle	14	20
6	Average Connectivity	0.21	0.55
7	Full load power	20 W for single and 1200 W for multiple	3.92 W to 180 W
8	Number of TRx	1 for single and 8 for multiple	1 for single and 9 for multiple

IV. CONCLUSION

This research presents an efficient approach for cooperative energy efficiency maximization algorithm in 5G ultra-dense networks. The interference will be avoidance. Ultra-dense networks enhance the system capacity via exploring both spatial and frequency diversities. The interference and green design problems were more complex due to the intrinsic densification and scalability, and at the same time it requires distributed control with reduced signaling overhead. Therefore it is clear from the simulated results that the proposed approach gives the significant better results than previous approach.

REFERENCES

1. M. J. Daas, M. Jubran and M. Hussein, "Energy Management Framework for 5G Ultra-Dense Networks Using Graph Theory," in IEEE Access, vol. 7, pp. 175313-175323, 2019, doi: 10.1109/ACCESS.2019.2957378.
2. F. Malandrino, C. F. Chiasserini, C. Casetti, G. Landi and M. Capitani, "An Optimization-Enhanced MANO for Energy-Efficient 5G Networks," in IEEE/ACM Transactions on Networking, vol. 27, no. 4, pp. 1756-1769, Aug. 2019, doi: 10.1109/TNET.2019.2931038.
3. F. Elsherif, E. K. P. Chong and J. Kim, "Energy-Efficient Base Station Control Framework for 5G Cellular Networks Based on Markov Decision Process," in IEEE Transactions on Vehicular Technology, vol. 68, no. 9, pp. 9267-9279, Sept. 2019, doi: 10.1109/TVT.2019.2931304.
4. J. Gang and V. Friderikos, "Inter-Tenant Resource Sharing and Power Allocation in 5G Virtual Networks," in IEEE Transactions on Vehicular Technology, vol. 68, no. 8, pp. 7931-7943, Aug. 2019, doi: 10.1109/TVT.2019.2917426.
5. J. Chakareski, S. Naqvi, N. Mastronarde, J. Xu, F. Afghah and A. Razi, "An Energy Efficient Framework for UAV-Assisted Millimeter Wave 5G Heterogeneous Cellular Networks," in IEEE Transactions on Green Communications and Networking, vol. 3, no. 1, pp. 37-44, March 2019, doi: 10.1109/TGCN.2019.2892141.
6. A. A. Salem, S. El-Rabaie and M. Shokair, "Energy efficient ultra-dense networks based on multi-objective optimisation framework," in IET Networks, vol. 7, no. 6, pp. 398-405, 11 2018, doi: 10.1049/iet-net.2017.0215.
7. C. Weng, K. Lin, B. P. S. Sahoo and H. Wei, "Beam-Aware Dormant and Scheduling Mechanism for 5G Millimeter Wave Cellular Systems," in IEEE Transactions on Vehicular Technology, vol. 67, no. 11, pp. 10935-10949, Nov. 2018, doi: 10.1109/TVT.2018.2870694.
8. Z. Song, Q. Ni and X. Sun, "Spectrum and Energy Efficient Resource Allocation With QoS Requirements for Hybrid MC-NOMA 5G Systems," in IEEE Access, vol. 6, pp. 37055-37069, 2018, doi: 10.1109/ACCESS.2018.2851609.
9. A. Deshpande and R. Sharma, “Anomaly Detection using Optimized Features using Genetic Algorithm and MultiEnsemble Classifier”, IJOSTHE, vol. 5, no. 6, p. 7, Dec.2018.https://doi.org/10.24113/ojssports.v5i6.79
10. J. Tang, D. K. C. So, N. Zhao, A. Shojaeifard and K. Wong, "Energy Efficiency Optimization With SWIPT in MIMO Broadcast Channels for Internet of Things," in IEEE Internet of Things Journal, vol. 5, no. 4, pp. 2605-2619, Aug. 2018, doi: 10.1109/JIOT.2017.2785861.
11. O. Aydin, E. A. Jorswieck, D. Aziz and A. Zappone, "Energy-Spectral Efficiency Tradeoffs in 5G Multi-Operator Networks With Heterogeneous Constraints," in IEEE Transactions on Wireless Communications, vol. 16, no. 9, pp. 5869-5881, Sept. 2017, doi: 10.1109/TWC.2017.2716948.
12. A. Yadav, O. A. Dobre and N. Ansari, "Energy and Traffic Aware Full-Duplex Communications for 5G Systems," in IEEE Access, vol. 5, pp. 11278-11290, 2017, doi: 10.1109/ACCESS.2017.2696822.