Resource Optimization with Load Coupling in Multi-cell NOMA

ABSTRACT

Optimizing non-orthogonal multiple access (NOMA) in multi-cell scenarios is much more challenging than the singlecell case because inter-cell interference must be considered. Most papers addressing NOMA consider a single cell. We take a significant step of analyzing NOMA in multi-cell scenarios. We explore the potential of NOMA networks in achieving optimal resource utilization with arbitrary topologies. Towards this goal, we investigate a broad class of problems consisting in optimizing power allocation and user pairing for any cost function that is monotonically increasing in time-frequency resource consumption. We propose an algorithm that achieves global optimality for this problem class. The basic idea is to prove that solving the joint optimization problem of power allocation, user pair selection, and time-frequency resource allocation amounts to solving a so-called iterated function without a closed form. We prove that the algorithm approaches optimality with fast convergence. Numerically, we evaluate and demonstrate the performance of NOMA for multi-cell scenarios in terms of resource efficiency and load balancing.

EXISTING SYSTEM

- In existing system, it uses stochastic geometry to model the inter-cell interference in NOMA. Hence the results do not apply for analyzing network with specific given network topology.
- It optimizes energy efficiency in multi-cell NOMA with downlink power control.
- However, the aspect of determining which users share resource by SIC.

PROPOSED SYSTEM

- We propose an efficient algorithm for obtaining the equilibrium.
- Furthermore, we prove that the equilibrium is the global optimum for resource optimization in multi-cell NOMA and thus a wide class of resource optimization problems can be optimally solved by our algorithm.
- For multi-cell NOMA, not only the time-frequency resource allocation but also the power splits and user pairings in all cells are coupled together for the same reason.

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- Processor - Intel core i3
- RAM - 2B
- Hard Disk - 20 GB

SOFTWARE REQUIREMENTS

- Operating System : LINUX
- Tool : Network Simulator-2
- Front End : OTCL (Object Oriented Tool Command Language)

REFERENCE

[1] L. You, L. Lei, D. Yuan, S. Sun, S. Chatzinotas, and B. Ottersten, “A framework for optimizing multi-cell NOMA: Delivering demand with less resource,” in 2017 IEEE GLOBECOM, 2017.

[2] S. M. R. Islam, N. Avazov, O. A. Dobre, and K. S. Kwak, “Powerdomain non-orthogonal multiple access (NOMA) in 5G systems: Potentials and challenges,” IEEE Communications Surveys Tutorials, vol. 19, no. 2, pp. 721–742, 2017.

[3] W. Shin, M. Vaezi, B. Lee, D. J. Love, J. Lee, and H. V. Poor, “Non-orthogonal multiple access in multi-cell networks: Theory, performance, and practical challenges,” arXiv.org, 2016. [Online]. Available: https://arxiv.org/pdf/1611.01607.pdf

[4] Z. Ding, P. Fan, and H. V. Poor, “Impact of user pairing on 5G nonorthogonal multiple-access downlink transmissions,” IEEE Transactions on Vehicular Technology, vol. 65, no. 8, pp. 6010–6023, 2016.

[5] “Evaluation methodologies for downlink multiuser superposition transmissions,” 3GPP, Tech. Rep. R1-153332, 2014.