A Learning Approach for Low-Complexity Optimization of Energy Efficiency in Multi-Carrier Wireless Networks

ABSTRACT

This paper proposes computationally efficient algorithms to maximize the energy efficiency in multi-carrier wireless interference networks, by a suitable allocation of the system radio resources, namely the transmit powers and subcarrier assignment. The problem is formulated as the maximization of the system global energy efficiency (GEE) subject to both maximum power and minimum rate constraints. This leads to a challenging non-convex fractional problem, which is tackled through an interplay of fractional programming, learning, and game theory. The proposed algorithmic framework is provably convergent and has a complexity linear in both the number of users and subcarriers, whereas other available solutions can only guarantee a polynomial complexity in the number of users and subcarriers. Numerical results show that the proposed method performs similarly as other, more complex, algorithms.

EXISTING SYSTEM

- In existing system, the non-cooperative, energy efficient power control problem is extended to account for minimum rate constraints.
- This problem is analyzed by employing the tool of generalized non-cooperative games.
- In the focus is on small-cell networks, whereas in a more general setup is considered and a framework fornon-cooperative energy efficiency maximization is provided, encompassing several 5G candidate technologies.

PROPOSED SYSTEM

- We propose to tackle the inner problem modeling it as a potential game, and developing an iterative method which improves the GEE at each iteration and eventually converges towards an efficient solution.
- The maximization of the system GEE subject to both maximum power and minimum rate constraints has been tackled by merging fractional programming, game theory, and learning tools.
- The approach will be to provide a computationally efficient method to derive (possibly) power allocation vectors.

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] Ericsson White Paper, “More than 50 billion connected devices,” Ericsson, Tech. Rep. 284 23-3149 Uen, Feb. 2011.

[2] “NGMN alliance 5G white paper,” https://www.ngmn.org/5g-whitepaper/ 5g-white-paper.html, 2015.

[3] S. Buzzi, I. Chih-Lin, T. E. Klein, H. V. Poor, C. Yang, and A. Zappone, “A survey of energy-efficient techniques for 5G networks and challenges ahead,” IEEE Journal on Selected Areas in Communications, vol. 34, no. 4, pp. 697–709, 2016.

[4] A. Zappone and E. Jorswieck, “Energy efficiency in wireless networks via fractional programming theory,” Foundations and TrendsR in Communications and Information Theory, vol. 11, no. 3-4, pp. 185–396, June 2015.

[5] C. Isheden, Z. Chong, E. A. Jorswieck, and G. Fettweis, “Framework for link-level energy efficiency optimization with informed transmitter,” IEEE Transactions on Wireless Communications, vol. 11, no. 8, pp. 2946–2957, August 2012.