Gürkan Gür

Thesis Supervisor: Prof. Fatih Alagöz

Energy Efficiency Analysis and Modeling of Cognitive and Heterogeneous Wireless Networks

Abstract

The surging energy costs and the environmental consequences of energy generation and exploitation have put energy efficiency asp ect of wireless systems into focus in an unprecedented manner. Moreover, the capacity expectations and requirements for wireless networks have been relentlessly increasing with the adoption of new services and sophisticated wireless terminals. In this thesis, we evaluate cognitive and heterogeneous wireless network paradigms from energy efficiency perspective that has become vital due to the above mentioned phenomena. We specifically focus on energy efficiency analysis and modeling of these systems for realizing the "green networks'' objective. We first provide a comprehensive account of energy efficiency of wireless networks. At a cross-sectional level, we consider cognitive radios (CR) paradigm which is affecting all facets of wireless data communications. The CR concept is evaluated from the "energy-efficient operation" and "energy efficiency enabler" perspectives. At the microscopic level, we focus on small cells, namely femtocells, and propose a new networking paradigm called cognitive femtocell networks (CFN). We analyze them in terms of energy efficiency via our analytical model and compare their performance with that of macro cell-only networks as well as traditional femtocell networks.

PUBLICATIONS

Book Chapters

1. S. Bayhan, **G. Gür** and F. Alagöz, "Cognitive Capabilities for Femtocell Networks: Cognitive Femtocells", *Springer Lecture Notes in Electrical Eng.,* vol. 116, H.Venkataraman and G.-M. Muntean (Eds.), 2012.

Journals

1. **G. Gür** and F.Alagöz, "Green Wireless Communications via Cognitive Dimension: An Overview", *IEEE Network - SI on Energy Efficient Networks,* vol. 25, no. 2, pp. 50-56, March/April 2011. (SCI - 2011 IF: 2.239) [*selected to IEEE ComSoc Best Reading on Green Communications list* - http://www.comsoc.org/best-readings/topics/green]

2. **G. Gür,** S. Bayhan, and F. Alagöz, "Cognitive Femtocell Networks: An Overlay Architecture for Localized Dynamic Spectrum Access", *IEEE Wireless Communications Magazine - Special Issue on Dynamic Spectrum Management,* vol. 17, no. 4, pp. 62-70, August 2010. (SCI - 2011 IF: 2.575) [*selected to IEEE ComSoc Best Reading on Cognitive Radio list* - http://www.comsoc.org/best-readings/topics/cognitive-radio]

3. F. Alagöz and **G. Gür**, "Energy Efficiency and Satellite Networking: A Holistic Overview", *The Proceedings of IEEE (invited paper),* vol. 99, no. 11, pp. 1954 - 1979, November 2011. (SCI - 2011 Impact Factor [IF]: 6.81).

Conferences

1. **G. Gür,** S. Bayhan, and F. Alagöz, "Energy Efficiency Impact of Cognitive Femtocell Networks", *The First ACM workshop on Cognitive Radio Architectures for Broadband (CRAB 2013), ACM MOBICOM 2013*, Oct. 4 2013, Miami, FL, USA.

2. **G. Gür** and F. Alagöz, "Energy Efficient Layered Content Dissemination for Multi-mode Cognitive Radios", *Proc. First International Black Sea Conference on Communications and Networking (BlackSeaCom 2013),* July 2013, Batumi, Georgia.

Google Scholar Metrics (for all publications, as of Feb 2015)

Citations	437
h-index	11
i10-index	11

Defense Jury Members

1. Prof. Fatih Alagöz — Boğaziçi University
2. Prof. Özgür Barış Akan — Koç University
3. Prof. Mehmet Ufuk Çağlayan — Boğaziçi University
4. Assoc. Prof. Hacı Ali Mantar — Gebze Yüksek Teknoloji Enstitüsü
5. Assoc. Prof. Tuna Tuğcu — Boğaziçi University

Defense Date: 29.05.2013