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"Can Mobility Improve WSN Performance?"
Thursday, February 28, 2013 • 2:30 p.m. • HEC 450

In this talk we describe the contribution of controlled mobility to the enhancement of the performance of wireless sensors networks (WSNs). In particular, we are interested in using mobility for increasing their lifetime i.e., the period of time the network is able to provide its intended functionalities.

More specifically, for WSNs that comprise a large number of statically placed sensor nodes, transmitting data to a collection point (the sink), we show that by controlling the sink movements we can obtain remarkable lifetime improvements. Our approach to determine sink movements starts with defining a mixed Integer Linear Programming (MILP) analytical model whose solution determines those sink routes that maximize network lifetime. We then define the first heuristics for controlled sink movements that are fully distributed and localized.

The Greedy Maximum Residual Energy (GMRE) heuristic lets the sink move from its current location to a new site as if drawn toward the area where nodes have the highest residual energy. We also introduce a simple distributed mobility scheme (Random Movement or RM) according to which the sink moves uncontrolled and randomly throughout the network. The different mobility schemes are compared through ns2-based simulations in networks with different nodes deployment, data routing protocols, and constraints on the sink movements.

In all considered scenarios, we observe that moving the sink always increases network lifetime.

In particular, our experiments show that controlling the mobility of the sink leads to remarkable improvements, which are as high as sixfold compared to having the sink statically (and optimally) placed, and as high as twofold compared with uncontrolled mobility.

BIOGRAPHY

Stefano Basagni holds a Ph.D. in electrical engineering from the University of Texas at Dallas (December 2001) and a Ph.D. in computer science from the University of Milano, Italy (May 1998). Since Winter 2002 he is on faculty at the Department of Electrical and Computer Engineering at Northeastern University, in Boston, MA, where he is currently associate professor. Dr. Basagni's current research interests concern research and implementation aspects of mobile networks and wireless communications systems, wireless sensor networking (underwater and terrestrial), definition and performance evaluation of network protocols and theoretical and practical aspects of distributed algorithms.

Dr. Basagni has published over seven dozens of highly cited, refereed technical papers and book chapters. He is also co-editor of three books. Dr. Basagni served as a guest editor of special issues of several international journals, including Springer MONET, Wiley's WCMC, and Elsevier's journal Algorithmica. He has been the TPC co-chair of international conferences such as ACM Dial M for Mobility (2004), Med Hoc Net (2006), IEEE SECON (2010), IEEE Globecom (AHSN Symposium, 2012), IEEE MASS (2012) and IEEE WiMob (2013).

Dr. Basagni serves as a member of the editorial board, the organizing committee and of the technical program committee of ACM and IEEE journals and international conferences. He is a senior member of the ACM (including the ACM SIGMOBILE), a senior member of the IEEE (Computer and Communication societies), a member of ASEE (American Society for Engineering Education) and of CUR (Council for Undergraduate Education).

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