



Dept. of Electrical and Computer Eng.

Colloquium

Modeling Wireless Sensor Networks

Bhaskar Krishnamachari - USC

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Dreese Laboratory Room: 260, 2015 Neil Avenue,
OSU Campus



Abstract: Modeling, i.e., building a simplified quantitative representation of reality, is essential to better understand how a system behaves with respect to key parameters, identify its limitations, and determine ways in which it can be made to operate more efficiently. We present the descriptive and prescriptive uses of modeling in the context of wireless sensor networks, via case studies from ongoing research that span a wide spectrum from bottom-up empirical observation-based modeling to top-down analysis and optimization, from the link layer up to applications.

We begin by addressing modeling issues pertaining to wireless link quality. We present an analytical model that explains many recent empirical observations pertaining to the existence of a large gray/transitional region, and some observations regarding concurrent transmissions suggesting that current wireless MAC protocols are overly conservative in suppressing simultaneous communications.

We then present two studies pertaining to higher layers. We derive scaling laws for unstructured and structured data-centric querying protocols, characterizing the application conditions that can be supported by arbitrarily large sensor network deployments, so long as the per-node energy resources are kept bounded. We also present an optimization framework to design a fair and efficient rate-control scheme for data gathering.

Biography:

Bhaskar Krishnamachari received his B.E. in Electrical Engineering from The Cooper Union in 1998 and his M.S. and Ph.D. in Electrical Engineering from Cornell University in 1999 and 2002 respectively. He is currently an Assistant Professor in the EE and CS departments at USC, where he holds the Philip and Cayley MacDonald Early Career Endowed Chair. His research focuses on the analysis and design of scalable data collection mechanisms for wireless sensor networks. He received the 2004 NSF CAREER award, the USC Viterbi School of Engineering's outstanding junior faculty award in 2005, and has received best paper awards at IPSN '04 and MSWiM '06. He serves on the editorial boards of the Ad Hoc Networks journal, the Pervasive and Mobile Computing Journal, the Mobile Computing and Communications Review, the Journal on Wireless Communications and Networking, and is the Vice Chair of the Sensor Networks and Ubiquitous Computing Track for IEEE ICDCS 2007. He is the author of a text titled "Networking Wireless Sensors", published by Cambridge University Press.

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