Tutorial T-10: Nanoscale Wireless Networking: Opportunities, Challenges, and Recent Advances

Presenter: Mahbub Hassan (University of New South Wales, Sydney, Australia)

Tutorial Overview

Advancement in nanotechnology has made it possible to manufacture sensors, circuits and devices measuring only nanometers in size. This development is creating an extraordinary opportunity to observe, interact, and optimize physical systems from the very bottom. Wireless communication and networking at nanoscale, however, faces new challenges not encountered in conventional sensor networks. For example, nanoscale antennae call for wireless communication in the Terahertz band, which encounters new path loss and noise phenomena posing significant challenges for many target applications of such networking. Nanoscale computing and communication is a new and rapidly growing field of research promoting collaboration between wireless networking, nanotechnology, and other fundamental disciplines. The objective of this tutorial is to present the opportunities, challenges, and a survey of recent advancements of this new and growing inter-disciplinary field.

The outline of the tutorial is given below:

- Module 1: Applications (including medical, chemical, and agricultural applications of nanoscale networking)
- Module 2: Energy (energy storage, harvesting and consumption models for nanoscale devices including nanobatteries, nanogenerators, and nanotransceivers)
- Module 3: Antenna, propagation, and noise (novel material-based antenna technology as well as new propagation and noise models and tools used to estimate path loss for nanoscale communication in different environments)
- Module 4: Simulation (available tools for simulating nanoscale communication environments)
- Module 5: Communication protocols (modulation and coding, power control, MAC, and routing for nanoscale communications)
- Module 6: Emerging research directions and open problems in nanoscale networking

Presenter Biography

Mahbub Hassan is a Full Professor in the School of Computer Science and Engineering, the University of New South Wales, Sydney, Australia, and a Distinguished Lecturer of IEEE (COMSOC) for 2013 to 2016. He delivered keynote and invited speeches at several international conferences and worked as Visiting Professor at Osaka University and University of Nantes. He was a tutorial speaker at IEEE WPMC 2014, IEEE ICC 2012, and IEEE VTC 2011. He is currently an Editor of IEEE Communications Surveys and Tutorial and has previously served as Guest Editor for Elsevier Nano Communications Network, IEEE Network and IEEE Communications Magazine. He has served in TPC and organising committee of numerous international conferences and currently serving in the TPC of the newly established ACM NANOCOM conference. He has co-authored three books, one US patent, and over 150 refereed articles. Professor Hassan has earned a PhD from Monash University, Australia, and an MSc from University of Victoria, Canada, both in Computer Science. More information about Professor Hassan is available from http://www.cse.unsw.edu.au/~mahbub.