Computer Science Seminar

Context Sensing from Kinetic Energy Harvesting in Mobile Devices

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Kinetic energy harvesting (KEH) refers to the conversion of kinetic or motion energy into useful electrical energy. With recent advancements in low power electronics and highly efficient KEH materials, it is perhaps time to consider KEH as a potential component of future mobile devices. In this talk, I will discuss a new research framework that treats the harvested kinetic energy as a novel source of information for detecting a wide range of user contexts without continuously powering the conventional motion sensors. The rationale of this framework is that different user activities and contexts produce distinguishable energy, and hence have the unique fingerprints in the harvested energy signals. Thus, KEH will be two in one, both an energy harvester and a context detection sensor (power free). By not having to power conventional sensors, this framework promises significant reduction in power consumption, thus bringing the possibility of sustained user monitoring without battery recharging. I will summarize our recent work in this area and share experimental results that demonstrate the feasibility of piezoelectric energy harvesters for activity classification, step detection, calorie expenditure estimation, voice command recognition, transportation mode detection, and even identification of humans. I will also share some results from a recent experiment that confirms that KEH can also be used as an acoustic communication receiver.

Bio: Mahbub Hassan is a Professor in the School of Computer Science and Engineering, the University of New South Wales, Sydney and recently served as a Distinguished Lecturer of IEEE (COMSOC) for 2013-2016. He worked as Visiting Professor at Osaka University, Japan, University of Nantes, France, and National Cheng Kung University, Taiwan. He has co-authored three books, which are used in universities across North America, Europe, and Asia. He is currently an Editor of IEEE Communications Surveys and Tutorial and has previously served as Editor for IEEE Network, IEEE Communications Magazine, and Computer Communications. Professor Hassan has completed PhD from Monash University, Australia and MSc from University of Victoria, Canada. More information about Professor Hassan is available from http://www.cse.unsw.edu.au/~mahbub.

Date: March 10, 2017

Time: 2:00 pm

209 Computer Science Building

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