

Smart Living Candidate Seminar

Real-time Monitoring of Cyber Physical Critical Infrastructure Systems

Dr. Wan Du, Nanyang Technological University of Singapore

Cyber physical systems and Internet of things systems are essential to most smart living applications, like smart infrastructure and smart building. In a Cyber Physical System (CPS, also known as system of systems), the cyber system and the physical system are connected by a networked sensing system. To enable accurate and real-time information exchange between the first two systems, the networked sensing system must be able to provide fast data collection and dissemination that can adapt to different time-variant environments.

In this talk, I will introduce my research experience on building adaptive and fast networked sensing systems for CPS. In an interdisciplinary project, I am the team leader to develop a networked sensing system that measures the water quality of urban reservoirs and the spatial wind distribution over the water surface, which in turn enables real-time monitoring and analysis of water quality for smart living. Three fundamental research problems have been solved. I worked with my colleagues and found the best locations for wind sensors by studying the correlation of the wind stress at different locations. 10 wind sensors have been deployed in an urban reservoir of Singapore. To collect data from the deployed sensors, we further developed a sparse wireless networking system that provided adaptive communications over long-distance low-power wireless links and efficient data collection over multi-hop paths. To remotely update the software of the deploy sensors or diffuse a bulk of data to them, we designed a fast data dissemination protocol which significantly improved the data dissemination efficiency by transmitting rateless-encoded packets over constructive interference and pipelining. Besides the above academic achievements, our system has been providing essential information for Public Utility Board of Singapore to conduct smart reservoir management, which makes the project socially responsible as well.

Bio: Dr. Wan Du works as a research fellow at Nanyang Technological University of Singapore since December 2011. He received his PhD degree in Electronics, Electrotechnics and Automation from University of Lyon, France, in 2011, and his Master degree and Bachelor degree in Electrical Engineering from Beihang University, China, in 2008 and 2005 respectively. His research interests include cyber physical systems, the Internet of things, networked embedded systems and mobile computing. Dr. Du has published more than 20 papers in top conferences (e.g., MobiCom, SenSys, IPSN and INFOCOM) and journals (e.g., ToN, TMC and TWireless). He has received the best paper award of ACM SenSys 2015 and the best demo award of IEEE SECON 2014. He has also been invited to serve as a TPC member for some top conferences (e.g., INFOCOM 2018 and ICDCS 2017).

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