Faculty Candidate Seminar

Practical Self-adaptive Spectrum Access in Cognitive D2D Communications

Dr. Xingya Liu, Shanghai Jiao Tong University

Device-to-device (D2D) communications enable networked devices to exchange information among each other without human control and therefore creates what is known as the Internet-of-Things (IoT). However, a large number of connected devices, as envisioned for the IoT, will create challenges in terms of spectrum scarcity and significant control overhead, which falls into the solution domain of cognitive radio networks. It is expected that devices equipped with cognitive radios will be indispensable in order to realize the vision of IoT.

In such a network, due to the dynamically changing radio environment, unlike traditional wireless networks, a control channel that is commonly available to all devices may not exist or cannot last for a long time. Instead, any two devices need to perform channel hopping in a decentralized manner to rendezvous with each other for spectrum access. Although the spectrum access issue has been extensively investigated in both traditional single channel and multi-channel networks, there are unique challenges that are unexplored in the spectrum access design in cognitive radio networks.

In this talk, the new challenges for distributed spectrum access in cognitive D2D communications will be discussed. A new spectrum access framework consisting of both MAC layer and cross-layer protocols that specifically address these new challenges under practical scenarios will be presented. The proposed framework can achieve spectrum access with a high successful rate, short rendezvous delay, and low energy consumption in a self-adaptive manner. In addition, a novel analytical model will be given to mathematically analyze the performance of the proposed protocols in cognitive D2D communications.

Bio: Xingya Liu received the B.S. degree in Automation from Shanghai Jiao Tong University, Shanghai, China, in 2010, and the M.S. degree in Electrical and Computer Engineering from Pennsylvania State University, in 2012. He is currently finishing the Ph.D. degree in the Department of Electrical and Computer Engineering at the University of North Carolina at Charlotte. His research interests include protocol design, modeling, and analysis of spectrum management, network security, and data mining in emerging wireless networks (IoT, 5G, SDR, LiFi, etc.).

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