上海交通大学自动化系
Department of Automation
Shanghai Jiao Tong University

系统控制与信息处理教育部重点实验室
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Spectrum and Energy Efficient MAC for Wireless Ad Hoc Networks

Prof. Weihua Zhuang

University of Waterloo, Canada

Abstract:

The increasingly growing number of mobile devices and volume of mobile data traffic necessitate establishing an effective self-organizing wireless ad hoc network to efficiently utilize radio spectrum and energy. In this seminar, we present recent studies on how to dynamically coordinate the transmissions time and bandwidth based on instantaneous traffic load of the links in the network. First, we present a new energy-efficient medium access control (MAC) scheme for a fully connected wireless ad hoc network. Energy consumption is reduced by periodically putting radio interfaces in the sleep mode and by reducing transmission collisions. Second, we present a novel distributed MAC scheme based on dynamic space-reservation to effectively coordinate transmissions in a wireless ad hoc network. For each scheduled transmission, a proper space area around the receiver node is reserved to enhance spatial spectrum reuse. Third, we study joint scheduling and transmission power control in a wireless ad hoc network. Based on an asymptotic analysis, we propose a novel scheduling and transmission power control scheme to approach the maximum spectrum efficiency, subject to an energy consumption constraint. Simulation results demonstrate that the proposed solutions outperform existing MAC protocols.

Biography:

Weihua Zhuang has been with the Department of Electrical and Computer Engineering, University of Waterloo, Canada, since 1993, where she is a Professor and a Tier I Canada Research Chair in Wireless Communication Networks. Her current research focuses on resource allocation and QoS provisioning in wireless networks, and on smart grid. She is a co-recipient of several best paper awards from IEEE conferences. Dr. Zhuang was the Editor-in-Chief of IEEE Transactions on Vehicular Technology (2007-2013), and the Technical Program Chair of the IEEE VTC Fall 2017 and 2016. She is a Fellow of the IEEE, a Fellow of the Canadian Academy of Engineering, a Fellow of the Engineering Institute of Canada, and an elected member in the Board of Governors and Vice President Publications of the IEEE Vehicular Technology Society.