THE CHINESE UNIVERSITY OF HONG KONG
Institute of Network Coding
and
Department of Information Engineering
Seminar

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Effective Carrier Sensing in CSMA Networks under Cumulative Interference

by

Dr. Fu Liqun (付立群博士)
Postdoctoral Fellow, Institute of Network Coding
The Chinese University of Hong Kong

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The Chinese University of Hong Kong

Abstract

This paper proposes the concept of *safe carrier-sensing range* under the *cumulative interference model* that guarantees interference-safe (also known as hidden-node-free) transmissions in CSMA networks. Compared with a previous related concept of safe carrier-sensing range under the commonly assumed but less realistic pairwise interference model, we show that the safe carrier-sensing range under the cumulative interference model is larger by a *constant* multiplicative factor. For example, the factor is 1.4 if the SINR requirement is 10dB and the path-loss exponent is 4 in a noiseless case. We further show that the concept of a safe carrier-sensing range, although amenable to elegant analytical results, is inherently not compatible with the conventional power-threshold carrier-sensing mechanism (e.g., that used in IEEE 802.11). Specifically, the absolute power sensed by a node in the conventional carrier-sensing mechanism does not contain enough information for the node to derive its distances from other concurrent transmitting nodes. We show that, fortunately, a new carrier-sensing mechanism called Incremental-Power Carrier-Sensing (IPCS) can realize the carrier-sensing range concept in a simple way. Instead of monitoring the absolute detected power, the IPCS mechanism monitors every increment in the detected power. This means that IPCS can separate the detected power of every concurrent transmitter, and map the power profile to the required distance information. Our extensive simulation results indicate that IPCS can boost spatial reuse and network throughput by more than 60% relative to the conventional carrier-sensing mechanism. Last but not least, IPCS not only allows us to implement the safe carrier-sensing range, but also ties up a loose end in many other prior theoretical works that implicitly used a carrier-sensing range (interference-safe or otherwise) without an explicit design to realize it.

Biography

Liqun Fu is currently a postdoctoral fellow with the Institute of Network Coding at CUHK. She received the B.S. degree in Electrical Engineering from Xiamen University in 2003, the M.S. degree in Electrical Engineering from Tsinghua University in 2006, and the Ph.D. Degree in Information Engineering from The Chinese University of Hong Kong in 2010. From June to November 2009, she worked as a visiting research student in the Department of Electrical Engineering, Princeton University. Her research interests are in the area of wireless communications and networking, with current focus on physical-layer network coding, resource allocation, distributed protocol design, and wireless greening.

**ALL ARE WELCOME **

Host: Professor Raymond W.H. Yeung (Tel: 3943-8375, Email: whyeung@ie.cuhk.edu.hk)
Enquiries: Information Engineering Dept., CUHK (Tel.: 3943-8388)