



香港中文大學
The Chinese University of Hong Kong

Institute of Theoretical Computer Science and Communications

ITCSC Seminar

Capacity of Large-scale CSMA Wireless Networks

By

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4:30pm - 5:30pm

Rm. 1021, Ho Sin Hang Engineering Building, CUHK

Abstract:

In the literature, asymptotic studies of multi-hop wireless network capacity often consider only centralized and deterministic TDMA (time-division multi-access) coordination schemes. There have been fewer studies of the asymptotic capacity of large-scale wireless networks based on CSMA (carrier-sensing multi-access), which schedules transmissions in a distributed and random manner. With the rapid and widespread adoption of CSMA technology, a critical question is that whether CSMA networks can be as scalable as TDMA networks. To answer this question and explore the capacity of CSMA networks, we first formulate the models of CSMA protocols to take into account the unique CSMA characteristics, not captured by existing interference models in the literature. These CSMA models determine the feasible states, and consequently the capacity of CSMA networks. We then study the throughput efficiency of CSMA scheduling as compared to TDMA. Finally, we tune the CSMA parameters so as to maximize the throughput to the optimal order. As a result, we show that CSMA can achieve throughput as $\Omega(1/\sqrt{n})$, the same order as optimal centralized TDMA, on uniform random networks. Our CSMA scheme makes use of an efficient backbone-peripheral routing scheme and a careful design of dual carrier-sensing and dual channel scheme. We also address practical implementation issues of our capacity-optimal CSMA scheme.

This talk is based on a joint paper with Minghua Chen & Soung Chang Liew (The Chinese University of Hong Kong), to appear in ACM MobiCom 2009.

Biography:

Chi-Kin Chau is currently with Electrical and Electronic Department, University College London, as a Croucher Foundation research fellow. He is also a visiting scholar at Computer Laboratory, University of Cambridge. He received a Ph.D. from University of Cambridge, and a B.Eng. in Information Engineering from the Chinese University of Hong Kong.

***** ALL ARE WELCOME *****

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