



THE CHINESE UNIVERSITY OF HONG KONG
Department of Information Engineering

Seminar

**Percolation Theory and Large-Scale Wireless Networks:
Connectivity and Transmission Delay**

by

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Date : 13 July, 2009 (Mon.)
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Venue : Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

The mathematical theory of percolation has become a valuable tool for the analysis of large-scale wireless networks deployed in challenging environments. In this talk, we present some recent results on connectivity and transmission delay from a percolation-based perspective. We first study a model for wireless networks where each link in a random geometric graph is active or inactive according to a Markov on-off process. In this case, we show the existence of a phase transition where the dynamic network is either percolated for all time (supercritical) or the network is percolated at no time (subcritical). Due to the dynamic on-off behavior of links, a delay is incurred for information dissemination even when propagation delay is ignored. We show that this transmission delay scales linearly with the Euclidean distance between the sender and the receiver when the network is in the subcritical phase, and the delay scales sub-linearly with the distance if the network is in the supercritical phase. More interestingly, we show that these results can be used to study information dissemination in wireless networks with mobile nodes. Using a new analysis which maps a network of mobile nodes to a network of stationary nodes with dynamic links, we show that messages can be disseminated to all nodes in a mobile network even when the network is not percolated at any fixed instant.

Joint work with Zhenning Kong.

Biography

Edmund Yeh received his B.S. in Electrical Engineering with Distinction from Stanford University in 1994, his M.Phil in Engineering from the University of Cambridge in 1995, and his Ph.D. in Electrical Engineering and Computer Science from MIT in 2001. Since 2001, he has been on the faculty at Yale University, where he is currently an Associate Professor of Electrical Engineering (with joint appointments in Computer Science and Statistics).

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