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Network Coding & Network Tomography

Jul 8 (Friday), 14:00-16:00, Room 1-415, FIT Building

Abstract: Network tomography seeks to infer internal link status parameters (such as delay) through end-to-end measurements at (external) boundary nodes. As can be expected, such approaches generically suffer from identifiability problems; i.e., inability to uniquely identify individual link status for many typical network topologies. Background results characterizing network identifiability under end-to-end probe will be first presented. We next introduce an innovative approach to tomography based on linear network coding at all internal nodes and provide sufficient conditions under which any logical network is guaranteed to be identifiable. In the second part of this talk, we describe methods that exploit this inherent sparsity[1] in the problem. We establish a connection between network tomography problem and binary compressed sensing using expander graphs to

- provide conditions on the routing matrix of networks for which the network is k=1-identifiable.
- derive upper-bounds on estimation error on link delay when network in 1-identifiable.

Sumit Roy (Fellow, IEEE) received the B. Tech. degree from the Indian Institute of Technology (Kanpur) in 1983, and the M. S. and Ph. D. degrees from the University of California (Santa Barbara), all in Electrical Engineering in 1985 and 1988 respectively, as well as an M. A. in Statistics and Applied Probability in 1988. Presently he is Prof. of Electrical Engineering, Univ. of Washington where his research interests include analysis/design of wireless communication and sensor network systems. His recent research emphasis includes wireless LANs (802.11) and emerging 4G technologies, definition of multi-standard wireless inter-networking and cognitive radios, vehicular and underwater networks and sensor networking involving RFID technology. He spent 2001-03 on academic leave at Intel Wireless Technology Lab as a Senior Researcher engaged in systems architecture and standards development for ultra-wideband systems (Wireless PANs) and next generation high-speed wireless LANs. In 2008, he was Science Foundation of Ireland's Walton Fellow on a sabbatical at University College, Dublin. His activities for the IEEE Communications Society (ComSoc) includes membership of several technical (Cognitive Networks, Communications Theory) and conference program committees. He currently serves on the Editorial Board for IEEE Trans. Communications, IEEE Intelligent Transportation Systems and the new IEEE Trans. Smart Grid. His IEEE Fellow award cites his contributions to ``cross-layer design approaches to global wireless standards". He has engaged in professional service and global collaborations worldwide: having served on numerous external thesis committees (Canada, Israel, Thailand, HongKong), research collaborations with academic colleagues (Singapore, Korea, New Zealand) and service on national research panels and review boards (Ireland, HongKong, Qater).

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