



THE CHINESE UNIVERSITY OF HONG KONG
Department of Information Engineering

Seminar

**From Distributed Optimization Theory to In-Network
Data Processing in Wireless Sensor Networks**

by
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Date : 7 December, 2015 (Monday)
Time : 11:15am – 12:15pm
Venue : Room 833 Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

In this talk, the speaker will begin with a brief overview of distributed optimization theory, including convex optimization problems for which distributed solution techniques exist and converge. Allocation of network resources often can be formulated as optimization problems. The most famous TCP (Transport Control Protocol) on Internet has been shown to operate as distributed algorithms, which optimize some utility functions. As for wireless ad-hoc and sensor networks, it is well known that each link capacity in these networks depends on the transmission power of other links. In addition, the quality of multimedia services supported by these networks cannot be represented by a concave function of the amount of allocated bandwidth. These factors unfortunately make the resource allocation problem for the wireless networks become a non-convex optimization problem. New distributed solution techniques will be presented to solve these problems and numerical examples will also be provided.

As the second part of this talk, the speaker considers the in-network data processing in wireless sensor networks where data are aggregated (fused) along the way they are transferred toward the end user. Determining the optimal degree of data aggregation at each node in order to minimize the total energy consumption while meeting the quality of information requirement can be formulated as a non-linear optimization problem. Using a theoretical condition, the problem is proved to have zero duality gap and can be solved using a distributed algorithm. Numerical results will be presented to verify the proposed solution technique. Future work on integrating data or signal processing techniques with the distributed solution framework will be discussed.

Biography

Kin K. Leung received his B.S. degree from the Chinese University of Hong Kong in 1980, and his M.S. and Ph.D. degrees from University of California, Los Angeles, in 1982 and 1985, respectively. He joined AT&T Bell Labs in New Jersey in 1986 and worked at its successor companies, AT&T Labs and Bell Labs of Lucent Technologies, until 2004. Since then, he has been the Tanaka Chair Professor in the Electrical and Electronic Engineering (EEE), and Computing Departments at Imperial College in London. He is the Head of Communications and Signal Processing Group in the EEE Department. His research interests focus on networking, protocols, optimization and modeling of wireless broadband, sensor and ad-hoc networks. He also works on multi-antenna and cross-layer designs for the physical layer of these networks.

Kin received the Distinguished Member of Technical Staff Award from AT&T Bell Labs (1994), was a co-recipient of the 1997 Lanchester Prize Honorable Mention Award, and was elected as an IEEE Fellow (2001). He received the Royal Society Wolfson Research Merits Award (2004-09), and was elected as member of Academia Europaea (2012). He has published 260+ papers and received 45+ U.S. patents. His results were applied to AT&T and Lucent products and services, while his WiFi technology recently went through a successful field trial at an airport in the U.K. and the network-tomography algorithms developed by his team on the ITA project have been used to facilitate new network management capabilities on military networks of the U.S. Army. In terms of professional activities, he serves as a member (2009-11) and the chairman (2012-15) of the IEEE Fellow Evaluation Committee for Communications Society. He has also served an editor and guest editor for 10 IEEE and ACM journals, and as committee members of many technical conferences.

**** ALL ARE WELCOME ****