



Colloquium

Computer Science Department, Oklahoma State University

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University of Oklahoma, Norman**

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214 MSCS, Stillwater; 205 NCB, Tulsa

Duality in Graphs and Logical Topology Survivability in a Layered Network

Abstract

Circuits and cutsets are dual concepts in graph theory. This duality has been the basis of several interesting techniques and algorithmic approaches of interest to problems in electrical/computer engineering, computer science and operations research. For almost every algorithm (called primal algorithm) based on circuits to solve a problem, there exists a dual algorithm based on cutsets and a primal-dual algorithm combining circuits and cutsets. The primal, dual and primal-dual algorithms possess certain unique characteristics that make one superior to the other two depending on the nature of the problem considered. In this talk, we first present certain well known results that capture the dual nature of circuits and cutsets. We then discuss, in detail, our most recent work where we provide a unified algorithmic framework for the survivable logical mapping problem in a layered network. IP-over-WDM network is an example of a layered network, where the optical backbone network forms the physical topology and the graph at the IP layer is the logical topology. The survivable logical topology mapping problem is to map each logical link into a path (called light path) between the corresponding end nodes in the physical topology such that failure of a physical link does not disconnect the logical topology. We show how to generalize an earlier work (based on circuits) on this problem by applying the duality theory. We also discuss the insights provided by this generalization.

Biography: Dr. Krishnaiyan Thulasiraman received the Bachelor's degree (1963) and Master's degree (1965) from the University of Madras, India, and the Ph.D. degree (1968) from IIT, Madras, India, all in Electrical Engineering. Since 1994, he holds the Hitachi Chair and is Professor in the School of Computer Science at the University of Oklahoma, Norman. Prior to joining the University of Oklahoma, Dr. Thulasiraman was professor (1981-1994) and chair (1993-1994) of the ECE Department in Concordia University, Montreal. He was on the faculty in the EE and CS departments of the IIT during 1965-1981. He has held visiting positions at the Tokyo Institute of Technology, University of Karlsruhe, University of Illinois at Urbana-Champaign and Chuo University, Tokyo.

Dr. Thulasiraman's research interests have been in graph theory, combinatorial optimization, algorithms and applications in a variety of areas in CS and EE. He has published extensively in archival journals, coauthored two text books "Graphs, Networks, and Algorithms" (1981) and "Graphs: Theory and Algorithms" (1992), both by Wiley Inter-Science, and several book chapters.

Dr. Thulasiraman has received several awards and honors: IIT Madras Distinguished Alumnus Award (2008), Fellow of the AAAS (2008), 2006 IEEE Circuits and Systems Society Technical Achievement Award, Endowed Gopalakrishnan Chair Professorship in CS at IIT Madras (Summer 2005), Elected Member of the European Academy of Sciences (2002), IEEE CAS Society Golden Jubilee Medal (1999), Fellow of the IEEE (1990) and Senior Research Fellowship of the Japan Society for Promotion of Science (1988).

Dr. Thulasiraman has been professionally very active, having held, among other positions, the position of Vice President for Administration of the IEEE Circuits and Systems Society.

(Refreshments will be served.)