NANYANG TECHNOLOGICAL UNIVERSITY

SEMINAR ANNOUNCEMENT

Efficient Distributed Approximation Algorithms

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Date : **26 March 2009 (Thursday)**
Time : **11 am – 12 pm**
Venue: **SPMS-Executive Classroom 1, MAS-03-06**
School of Physical and Mathematical Sciences

Distributed approximation algorithms tradeoff optimality of the solution for the amount of resources consumed by the distributed algorithm. With the advent of resource-constrained networks such as sensor and peer-to-peer networks it is critical to design efficient distributed algorithms for network optimization problems that have low communication and time complexity even possibly at the cost of a reduced quality of solution. This talk will present recent results on the design and analysis of efficient distributed approximation algorithms for fundamental network optimization problems including the minimum spanning tree (MST), the minimum Steiner tree and related problems, and the shortest paths problem. I will focus on a simple scheme called the Nearest Neighbor Tree (NNT) scheme and show how it leads to the first efficient distributed logarithmic-approximation algorithm for MST in arbitrary networks. Significantly, our result also shows that there can be an exponential time gap between exact and approximate distributed MST computation. Another consequence of our result is that an approximate MST in unit-disk graphs (which are popular models of wireless networks) and in random weighted networks (which can model power-law networks such as the Internet and peer-to-peer networks) can be found in almost optimal time in a simple and local fashion. I will then briefly discuss a uniform approach to designing distributed approximation algorithms using probabilistic tree embeddings. This approach leads to the first-known time-optimal distributed logarithmic-approximation algorithms for many fundamental problems including the generalized Steiner forest and the shortest paths problem. It also leads to an improved leader election algorithm in synchronous networks that is both time optimal and almost message optimal, thus partially answering an important open problem raised by David Peleg in 1990. I will conclude with a discussion on our recent results on designing energy-efficient distributed algorithms for wireless networks. Our results initiate a distributed algorithmic theory that uses energy complexity as a new performance measure to analyze distributed algorithms.

Speaker Biography

Dr. Gopal Pandurangan is an assistant professor of computer science at Purdue University since August 2002. He obtained his Ph.D. in computer science from Brown University in May 2002. His research interests are broadly in design and analysis of algorithms, in particular randomized algorithms and probabilistic analysis of algorithms, with applications to network algorithms and optimization, distributed algorithms, online algorithms, and computational biology. His research has tackled fundamental problems in all these areas. He has authored over forty papers published in refereed journals and conferences including in the premier journals and conferences in the areas of theory/algorithms, distributed computing, networking, and computational biology/bioinformatics. He has supervised and graduated two Ph.D. students and three Masters students. His research is funded by research grants from the US National Science Foundation and Purdue Research Foundation. He has served in the program committees of many international conferences and given over thirty invited talks in universities and research laboratories.

Host: Prof. Chee Yeow Meng, Head, Division of Mathematical Sciences, School of Physical and Mathematical Sciences

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