International Spring School on Algorithms and Applications (ISSAA 2015)

Date: February 25, 2015

Venue: Graduate Seminar Room, 5th floor, Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh.

Program Schedule

9:00 - 9:06	Welcome note by Prof. Dr. Mohammad Mahfuzul Islam, Honorable Head, CSE, BUET
9:06 - 9:12	Introduction to ISSAA by Prof. Dr. M. Kaykobad, CSE, BUET
9:12 - 9:18	Message from the Chief Guest Prof. Khaleda Ekram, Honorable VC, BUET
9:18 - 9:25	Vote of thanks by Prof. Dr. Md. Saidur Rahman, CSE, BUET
9:25 - 9:45	Tea Break and Networking
9:45 - 10:45	**Invited Talk - Prof. Michiko Inoue,** Dependable System Laboratory, Graduate School of Information Science, Nara Institute of Science and Technology (NAIST) *Title: Contention-Adaptive Shared Memory Mutual Exclusion Algorithm*
10:45 - 11:45	**Invited Talk - Prof. Etsuji Tomita,** The Advanced Algorithms Research Laboratory, The University of Electro-Communications (UEC Tokyo) *Title: Efficient Algorithms for Finding Maximum and Maximal Cliques*
11:45 - 12:45	Open Brainstorming Session *Session Chair: Prof. Dr. Md. Saidur Rahman, CSE, BUET*
12:45 -14:00	Lunch and Prayer Break
14:00 - 15:00	**Invited Talk - Prof. Subhas Chandra Nandy,** Advanced Computing & Microelectronic Unit, Indian Statistical Institute(ISI) *Title: Discrete Piercing Set for Unit Disks*
15:00 - 16:00	**Invited Talk - Prof. Sheung-Hung POON,** Department of Computer Science, National Tsing Hua University (NTHU)

	Title: Linkage Unfolding of Graph Structures in Two and Three Dimensions
16:00 - 16:30	Tea Break and Closing

Invited Talk Abstracts

Title: Discrete Piercing Set for Unit Disks

Speaker: Prof. Subhas Chandra Nandy

In this talk, we consider the approximation algorithms for the problem of computing the discrete piercing set for a given set S of n unit disks in R^2. The objective is to pierce all the given disks by choosing minimum number of centers of these given disks. We first present a simple $O(nlogk)$ time 5-factor approximation algorithm for this problem. Next, we show that the time complexity of the in-place 4-factor and 3-factor approximation algorithms for this problem are $O(n^6 log\ n)$ and $O(n^{11}logn)$ respectively. Finally, we propose a very important shifting lemma, which is of independent interest, and it helps in proposing a PTAS for the problem.

Title: Efficient Algorithms for Finding Maximum and Maximal Cliques

Speaker: Prof. Etsuji Tomita

A clique is a subgraph in which all pairs of vertices are mutually adjacent. A maximum clique is a clique of the maximum size. Thus, a maximum clique stands for a maximum collection of objects which are mutually related in some specified criterion. The so called maximum clique problem is one of the original 21 problems shown to be NP-complete by R. Karp (1972). Therefore, it is strongly believed that the maximum clique problem is not solvable easily, i.e. it would not be solvable in polynomial-time. Nevertheless, much work has been done on this problem, experimentally and theoretically. It attracts much attention especially recently since it has found many practical applications. Such examples abound in bioinformatics, drug design, pattern recognition and image processing, clustering, coding theory, design of quantum circuits, design of DNA and RNA sequences for bio-molecular computation, wireless networks and telecommunications, social network analysis, and many others. In this talk, we are concerned with recent progress of efficient algorithms for finding a maximum clique. We focus on branch-and-bound algorithms in which appropriate bounding condition is most crucial. The step-by-step improvements on the bounding condition and their effectiveness are presented. An optimal algorithm for enumerating all maximal cliques is also shown. We also give a

natural condition in which the maximum clique problem can be proved to be polynomial-time solvable. In addition, we address some of successful applications of these algorithms.