Discrete Mathematics Seminar

Time: Friday, 29 January 2010, 12:00-1:00 PM
Room: 238 Derrick Hall
Title: Time, space, and solution quality tradeoffs in combinatorial optimization algorithms
Speaker: Dr. Dan Tamir, Department of Computer Science

Abstract:

Generally, practical algorithms for combinatorial optimization use the minimum amount of memory necessary to find an optimal or sub-optimal solution to the underlying optimization problem.

This research concentrates on the tradeoff between time, space, and solution quality of two heuristics for combinatorial optimization, under a number of memory models.

We present several models of memory including, minimum memory, dedicated memory, infinite memory, cache, and bloom filter. In addition, we present two combinatorial problems: features selection and the TSP; as well as two combinatorial algorithms: the genetic algorithm and iterative hill climbing (IHC). Several seeding algorithms for the associated local search for the TSP solutions are described. We also present the notion of anytime algorithms, anyspace algorithms, and anytime-anyspace algorithms. We show that GA and IHC are (trivially) anytime algorithms, and the addition of memory can turn them into anytime anyspace algorithms.

We show that the anyspace version of the GA is actually an interesting variant of GA which outperforms the conventional GA in time and / or solution quality. In addition, we show that the anyspace version of the IHC outperforms the conventional algorithm in execution time, and the saving in execution time can result in better solution quality. Finally, we compare the results IHT to ‘semi-opt’ where ‘semi-opt’ is either the known results of several benchmarks from the TSPLIB or the results of a program that produces solutions which are within know “distance” from “opt.”

This is joint work with Clara Novoa (School of Engineering).