Efficient Continuous Algorithms for Combinatorial Optimization

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Abstract

The thesis concentrates on design, analysis, and implementation of efficient algorithms for large scale optimization problems with special emphasis on problems related to network flows and routing in high-speed networks. The main focus is on using continuous techniques for solving large combinatorial optimization problems in off-line and online settings.

Some of the major areas of work include:

- Developing and implementing new interior-point techniques for efficiently solving large scale multi-commodity network flow problems. These algorithms are based on solving linear and quadratic programming formulations of the problem.
- Designing fast algorithms based on continuous methods for approximate solution of *minimum cost* multi-commodity flow problem. These techniques are geared towards distributed implementation.
- Application of multi-commodity flow techniques for design and implementation of centralized and distributed algorithms for on-line routing of Virtual Circuits in ATM (Asynchronous Transfer Mode) networks.

Our approach is to design algorithms that have provably good worst or average case performance and demonstrate their efficiency by implementing and evaluating them on real data.