Approximation Algorithms
June 12–14, 2006

On the integrality gap for the minimum cost 2-edge connected multi-subgraph problem

Sylvia Boyd
sylvia@site.uottawa.ca
School of Information Technology & Engineering
University of Ottawa
800 *King Edward Ave.*
Ottawa, Ontario $K1N\ 6N5$
Canada

Abstract

In this paper we study the 2-edge connected multi-subgraph problem (2EC): Given a complete graph G on n nodes with nonnegative edge costs, find a minimum weight 2- edge connected multi-subgraph of G. The 2EC problem is well-known to be NP-hard. One direction which seems promising for finding improved solutions and approximation algorithms for this problem is the study of its linear programming (LP) relaxation, which provides a lower bound for 2EC. In this paper we examine the worst-case ratio (i.e. integrality gap) k between the optimal solutions of 2EC and its LP relaxation. Currently the exact value of k is not known, only that it lies somewhere between $\frac{6}{5}$ and $\frac{3}{2}$. Finding the exact value for k is difficult even for small values of n due to the exponential size of the data involved. We describe how we were able to overcome such problems to obtain the exact value of k for all n up 10, and partial results for n up to 13.

Joint work with Anthony Alexander, Paul Elliott-Magwood.