A Comparative Study
of Linear and Semidefinite Branch-and-Cut Methods
for Solving the Minimum Graph Bisection Problem

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Abstract: Semidefinite relaxations are known to deliver good approximations for combinatorial optimization problems like graph bisection. Using the spectral bundle method it is possible to exploit structural properties of the underlying problem and to apply, even to sparse large scale instances, cutting plane methods, probably the most successful technique in linear programming. We set up a common branch-and-cut framework for linear and semidefinite relaxations of the *minimum graph bisection problem*. It incorporates separation algorithms for valid inequalities presented in a recent study of the facial structure of the associated polytope by the same authors. Extensive numerical experiments show that the semidefinite branch-and-cut approach outperforms the classical simplex approach on a clear majority of the sparse large scale test instances. On instances from compiler design the simplex approach is faster.

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