Eisenblätter, Andreas
The semidefinite relaxation of the k-partition polytope is strong. (English) ⎡Zbl 1049.90136⎤
Cook, William J. (ed.) et al., Integer programming and combinatorial optimization. 9th international
IPCO conference, Cambridge, MA, USA, May 27–29, 2002. Proceedings. Berlin: Springer (ISBN 3-540-
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Summary: Radio frequency bandwidth has become a very scarce resource. This holds true in particular for
the popular mobile communication system GSM. Carefully planning the use of the available frequencies
is thus of great importance to GSM network operators. Heuristic optimization methods for this task are
known, which produce frequency plans causing only moderate amounts of disturbing interference in many
typical situations. In order to thoroughly assess the quality of the plans, however, lower bounds on the
unavoidable interference are in demand. The results obtained so far using linear programming and graph-
theoretic arguments do not suffice. By far the best lower bounds are currently obtained from semidefinite
programming. The link between semidefinite programming and the bound on unavoidable interference in
frequency planning is the semidefinite relaxation of the graph minimum k-partition problem.

Here, we take first steps to explain the surprising strength of the semidefinite relaxation. This bases
on a study of the solution set of the semidefinite relaxation in relation to the circumscribed k-partition
polytope. Our focus is on the huge class of hypermetric inequalities, which are valid and in many cases
facet-defining for the k-partition polytope. We show that a "slightly shifted version" of the hypermetric
inequalities is implicit to the semidefinite relaxation. In particular, no feasible point for the semidefinite
relaxation violates any of the facet-defining triangle inequalities for the k-partition polytope by more than
$\sqrt{2} - 1$ or any of the (exponentially many) facet-defining clique constraints by $\frac{1}{2}$ or more.

For the entire collection see [Zbl 0992.00060].

MSC:

90C57	Polyhedral combinatorics, branch-and-bound, branch-and-cut
90C22	Semidefinite programming
90B18	Communication networks in operations research

Cited in **11** Documents

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