ABSTRACT

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Budget constrained cut problems

The minimum and maximum cuts of an undirected edge-weighted graph are classic problems in graph theory. While the Min-Cut Problem can be solved in P, the Max-Cut Problem is NP-Complete.

Exact and heuristic methods have been developed for solving them. For both problems, we introduce a natural extension in which cutting an edge induces a cost. Our goal is to find a cut such that minimises the sum of the cut weights but, at the same time, it restricts its total cut cost to a given budget.

We prove that both restricted problems are NP-Complete and we also study some properties.

Finally, we develop exact algorithms to solve both and also a non-exact algorithm for the min-cut case based on a Lagreangean relaxation that provides most of the times optimal solutions. Their performance is reported by an extensive computational experience.