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# Application of general semi-infinite programming to lapidary cutting problems

Anton Winterfeld

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### Abstract

We consider a volume maximization problem arising in gemstone cutting industry. The problem is formulated as a general semi-infinite program (GSIP) and solved using an interior-point method developed by Stein [O. Stein, *Bi-level Strategies in Semi-infinite Programming*, Kluwer Academic Publishers, Boston, 2003]. It is shown, that the convexity assumption needed for the convergence of the algorithm can be satisfied by appropriate modelling. Clustering techniques are used to reduce the number of container constraints, which is necessary to make the subproblems practically tractable. An iterative process consisting of GSIP optimization and adaptive refinement steps is then employed to obtain an optimal solution which is also feasible for the original problem. Some numerical results based on real-world data are also presented.



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## Keywords

Large scale optimization; Semi-infinite programming; Nonlinear programming; Design centering

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