

Improved quadratic convex reformulation for variants of the 0-1 quadratic knapsack problem.

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Abstract

Convexification of the objective function of a 0-1 quadratic optimization problem, such as quadratic knapsack problems, is theoretically possible using an SDP model and its dual. We will discuss how one can improve the upper bound and the numerical difficulties encountered in the process. We will present the reformulation by employing matrix decomposition and piecewise linear representation of quadratic term for 0-1 variables, and will show that, one may be able to obtain an equivalent convex model and a better upper bound than the one obtained using a classical diagonal perturbed reformulation.

This approach has been applied successfully to variants of the 0-1 quadratic knapsack problem, such as multiple quadratic knapsack problem and exact k-item quadratic knapsack problem.