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An Exact Algorithm for Large-Scale Unconstrained Three Staged Cutting Problems with Same-Size Block Requirement

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Abstract

This paper deals with the two-dimensional cutting problem, in which a set of small rectangular pieces are cut from a large rectangle for the purpose of maximizing the total value of the pieces included. The two-dimensional cutting problem is a very hard problem to solve, for which optimal algorithms exist but tackle large-scale problems inefficiently. Cutting patterns usually not only come from real-world production demands, but also can simplify a problem into some sub-problems. The pattern algorithm for each sub-problem can be constituted with much higher running speed, and serve as approximate algorithms to the optimal algorithms. This paper proposes an exact algorithm for generating three staged same-size block cutting pattern. This algorithm uses knapsack approach combined with a dynamic programming recursion. The algorithm is compared with the well-known three-stage algorithm and the T-shape homogenous block algorithm through large-scale instances. The experiment results illustrate that the material usage of this paper's algorithm is higher than above algorithms within reasonable computational time.

Keywords: Cutting problems, dynamic programming, knapsack problem, same-size block.