

Two- and three-dimensional strip packing: a shaking procedure

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In the present work we propose a shaking procedure for the two- and three-dimensional strip packing problems (2SP and 3SP). A set of rectangular items of given dimensions have to be packed into a strip with fixed base and open height such that the covered height is minimized. The items can be rotated by 90 degrees. Both 2SP and 3SP are NP-hard. The proposed procedure builds upon the common bottom-left-fill methods (BLF). These constructive procedures sequentially put the items in the strip at the most bottom left position in which the item is non-overlapping with already placed items.

The shaking procedure starts from an ordered list of items I and given orientations R . First the BLF method is used to create an initial solution S . Then the procedure tries to improve this solution using different sorting criteria $c \in C$. Each improvement step re-sorts the list of items using a sorting criterion c and builds a new schedule with BLF using this re-sorted list. The latter steps are performed twice, producing solutions S' and S'' . The best solution is stored and returned.

The sorting criteria re-sort the items based on a previously constructed solution by looking at the coordinates of the corners of the items. For two dimensions we use four sorting criteria, while for three dimensions twelve sorting criteria are employed.

Experiments on the [1] test set, show high improvements of the shaking procedure upon the BLF. The average improvement varies between 5% and 22%, while the number of improved solutions is always above 900 out of 1000. These results indicate an excellent performance of the shaking procedure as a post-processing method. Similar results were observed for other datasets, and both for two- and three-dimensions.

References

- [1] E. K. Burke, G. Kendall, and G. Whitwell. 2004. *A New Placement Heuristic for the Orthogonal Stock-Cutting Problem*. Oper. Res. 52, 4 (2004), 655-671.