CONSTRUCTION FACTOR - SETS FOR THE ONE DIMENSIONAL PACKAGING STOCK PROBLEM

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We consider the well-known one-dimensional cutting stock problem (1CSP). The one-dimensional cutting stock problem (1CSP) can be formulated as follows. Smaller pieces $l_1, l_2, \ldots l_m$ have to be cut from larger stock material L, where m is the number of items. The objective is to minimize the amount of stock material needed to produce the ordered pieces.

The instances $(L, \mathbf{l})$ and $(\tilde{L}, \tilde{\mathbf{l}})$ are proper pattern-equivalent if

$$P(L, \mathbf{l}) = P(\tilde{L}, \tilde{\mathbf{l}}),$$

where

$$P(L, \mathbf{l}) = \left\{ \mathbf{a} \ : \ \sum_{j=1}^{m} l_j a_j \leq L, \ \mathbf{a} \in \{0,1\}^m \right\}.$$

Set $P(L,\ mathbfl)$ represents a particular equivalence class. The set of all possible instances can be splitted into equivalence classes using the binary pattern-equivalence as equivalence relation.

An algorithm for enumerating all possible sets $P(L, \mathbf{l})$ for a fixed m is presented.

This method is improved for searching proper non-IRUP instances with minimal number of items. We found the minimal number of items is $m = 10$ when a proper non-IRUP instance exists. We also found 365 equivalence classes that consist of such instances.

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ЛИТЕРАТУРА

1. J. Rietz, G. Scheithauer and J. Terno. Families of Non-IRUP instances of the one-dimensional cutting stock problem. *Discrete Appl. Math.* 121.1–3 (2002) 229–245.

2. J. Rietz and S. Dempe. Large gaps in one-dimensional cutting stock problems *Discrete Applied Mathematics* 156/10 (2008) 1929–1935.