

- We can limit the orientation of the items or enable a 90° rotation(Blum and Schmid 2013; Sarabian and Lee 2010);
- We can force a guillotine cut¹;
- We can impose a cost on each item (Pisinger and Sigurd 2005).
- Lodi et al. (1999)introduce four possible BPP subtypes based on the orientation and guillotine cut constraints:
 - 2DBPP|R|F: Items may be rotated by 90° (R), guillotine cut constraint not imposed (F);
 - 2DBPP|R|G: Items may be rotated by 90° (R), guillotine cut constraint is imposed (G);
 - 2DBPP|O|F: Orientation of items is fixed (O), guillotine cut constraint not imposed (F);
 - 2DBPP|O|G: Orientation of items is fixed (O), guillotine cut constraint is imposed (G).

In this article, on section 2, we will start by introducing the type of two-dimensional bin packing problem we are going to study. On section 3 we will present the algorithms we are going to implement and on section 4 we will present the benchmark instances that are used throughout the literature related to this problem. On section 5 we will discuss our results, comparing the number of bins and execution times of all algorithms. On section 6 we will do a brief conclusion of the work and present some future work.

2. Problem Description

In this article we are going to study the Rectangular Bin-packing Problem as stated in the following description (Pisinger and Sigurd 2007):

Assume that a set $\mathfrak{R} = \{1, \dots, n\}$ of rectangles is given, rectangle i having width w_i , and height h_i . We can use an infinite number of bins to pack the items, each bin has a width W and a height H . The objective is to minimize the number of bins used to pack all rectangles in \mathfrak{R} such that they do not overlap.

Following the Lodi et al. (1999) subtypes we are going to focus on the 2DBPP|O|F, fixed orientation and no guillotine cut.

For the sake of simplicity from now on, when we refer to 2DBPP in the article, we are referring to this definition.

3. Solution Approaches

The implementations done in this study follows each heuristic and meta-heuristic implementation basic ideas from the description of the papers in the literature(Bays 1977; Kirkpatrick, Gelatt, and Vecchi 1983; Osogami and Okano 2003; Wei et al. 2013). Nevertheless

