

User Manual

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1. Initial Step: Instance generator (from Dr. Pisinger's website)

Here we use the instance generator tool developed by Martello, S., Pisinger, D., & Vigo, D. [1]. It can randomly generate an instance, and then compute their lower bound as well as its optimal solution (if the instance size is less than 200 items). For more details, users may refer to the paper [1] and download the source code from the website below. <http://www.diku.dk/~pisinger/codes.html>

1. Martello, S., Pisinger, D., & Vigo, D. (2000). The three-dimensional bin packing problem. *Operations Research*, 48(2), 256-267.

Hint: When executing the instance generator tool, users need the following three inputs:

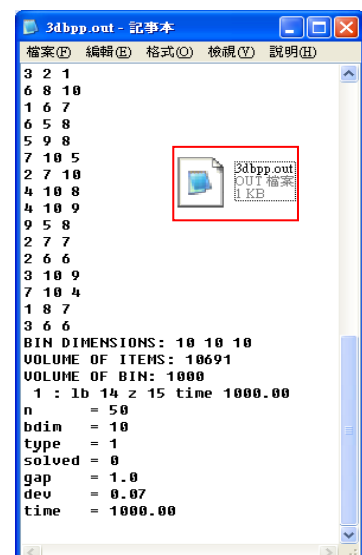
“n” is the number of items;

“bindim” is the size of bin; (Note that each bin is a cube.)

“type” is the data type defined as follows:

case 1: $w = \text{rint}(1, W/2)$; $h = \text{rint}(2 \cdot H/3, H)$; $d = \text{rint}(2 \cdot D/3, D)$;
case 2: $w = \text{rint}(2 \cdot W/3, W)$; $h = \text{rint}(1, H/2)$; $d = \text{rint}(2 \cdot D/3, D)$;
case 3: $w = \text{rint}(2 \cdot W/3, W)$; $h = \text{rint}(2 \cdot H/3, H)$; $d = \text{rint}(1, D/2)$;
case 4: $w = \text{rint}(W/2, H)$; $h = \text{rint}(H/2, H)$; $d = \text{rint}(D/2, D)$; ;
case 5: $w = \text{rint}(1, W/2)$; $h = \text{rint}(1, H/2)$; $d = \text{rint}(1, D/2)$;
case 6: $w = \text{rint}(1, 10)$; $h = \text{rint}(1, 10)$; $d = \text{rint}(1, 10)$;
case 7: $w = \text{rint}(1, 35)$; $h = \text{rint}(1, 35)$; $d = \text{rint}(1, 35)$;
case 8: $w = \text{rint}(1, 100)$; $h = \text{rint}(1, 100)$; $d = \text{rint}(1, 100)$;

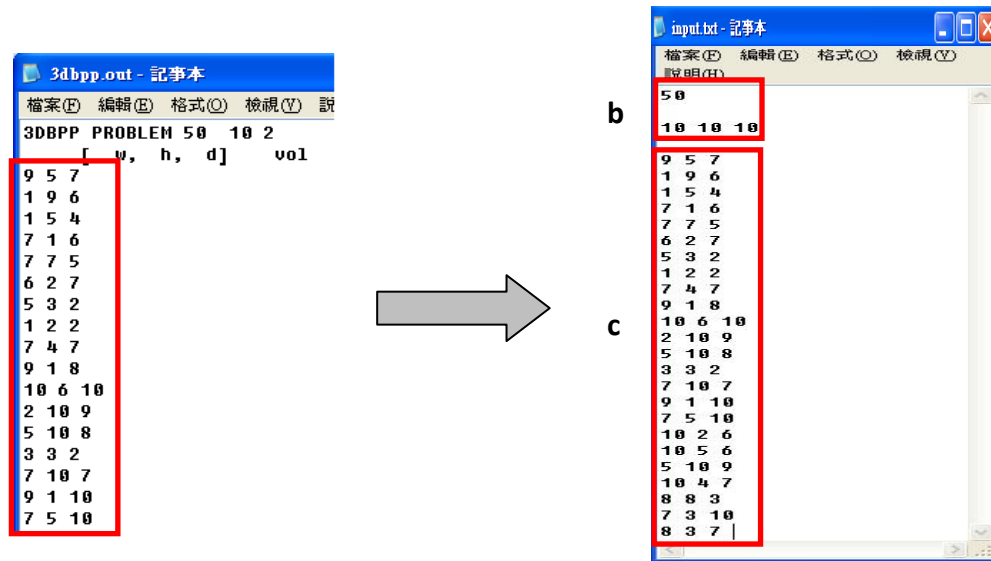
The file “3dbpp.out” will be derived after executng the tool. It includes the dimension info of each item, the value of lower bound (lb), and the optimal solution (z), if any. Note that z is not always optimal while the tool limits the execution time to 1000 seconds.



2. Main Step: Computing our results

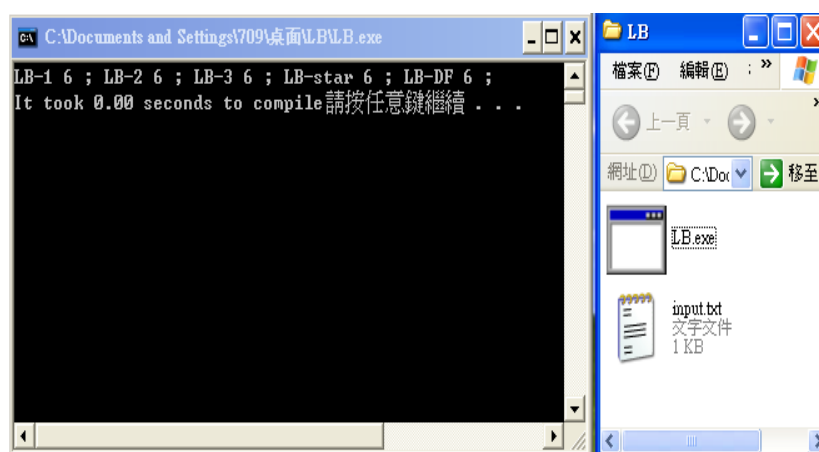
2-1. Input preparation

- New a txt file named “input.txt” in the same folder.
- Key in the number of items and each dimension of the given bin (see right side).
- Copy the dimension info of all the items (left side) and paste them in “input.txt” (right side).



2-2. Compute our new lower bounds

Just perform the executable file “LB.exe” with “input.txt”. Then, the value of our lower bounds will be derived.



2-3. By-product: compute a 3D packing via heuristic methods

Users can perform the executable file “BP.exe” with “input.txt” (of the same format) to obtain a heuristic solution.