

Benchmark data sets for the Blocks Relocation Problem with Stowage Plan (BRLP)

Under Construction

This group of data sets are used in the article

A GRASP approach for solving the Blocks Relocation Problem with Stowage Plan, Raka Jovanovic, Shunji Tanaka, Tatsushi Nishi and Stefan Voss, 2016

Link to : [DATA SETS](#)

The Blocks Relocation Problem with Stowage Plan (BRLP) has the following setting

1. Containers are of the same size and the problem setting is as follows.
2. The yard bay will be viewed as a two dimensional stacking array with W stacks and a maximal allowed height (number of tiers) H
3. The vessel bay will consist of W^v stacks. Each of them will have a maximal allowed height H_i^v
4. Each container c has a designated location in the vessel bay, specified with the vessel stack $vs(c)$ and a vessel tier $vt(c)$.
5. The initial configuration of the yard bay and the designated locations of containers in the vessel bay are known in advance. We will use the notation $ys(c)$ / $yt(c)$ to indicate the stack/tier in the yard bay of container c .
6. Only containers from the top of a stack can be accessed.
7. When a container is retrieved, it is moved from the yard bay to the vessel bay.
8. The relocation operations (movement of containers within the bay) are only allowed while a target container needs to be retrieved, which means no look-ahead or pre-marshalling. In case of the BRP this version of the problem is commonly called restricted.
9. Once a container is moved to the vessel bay it cannot be moved again.
10. Containers can only be placed on top of other containers or on the ground (tier 0) in both the vessel and the yard bay.

The objective of the BRLP is to minimize the number of relocation operations needed to move all the containers from the yard bay to their designated locations in the vessel bay. An illustration of the problem input is shown in the following figure:

A2	B3	C4	D4	E3	F2
A1	B2	C3	D3	E2	F1
	B1	C2	D2	E1	
		C1	D1		
A	B	C	D	E	F

E2	D3		D2	
C1	D5	D1	B1	C4
B3	A2	C3	E3	E1
A1	B2	F2	D4	C2
1	2	3	4	5

In practice the BRLP can be observed as solving several Blocks Relocation Problems (BRP) in parallel where each vessel stack gives us a separate loading list. The BRP can also be viewed as a restriction of the BRLP in which the vessel bay has only one stack.

Data sets

The data sets consist of a wide range of randomly generated problem instances. The number of containers N in each instance was between 10 and 390. In the generated problem instance the number of vessel stacks VS is set to 3, 5, 10, 15 and 20. The vessel bay has the same structure as in the figure above. For each vessel bay two yard bays have been generated having a maximal allowed tier YT of 6 or 8. The number of yard stacks YS in the container bay was selected so that the total occupancy would be around 66%. For each (N, VS, YS, YT) 40 different random container bay configurations have been generated.

File structure

The structure of each file is the following:

First line

Number Of Containers // included for easy reading
 N // I a single value giving the number of containers
 Number Of Yard Stacks // included for easy reading
 YS // a single value giving the number of yard stacks containers MaxTier of Yard
 MaxTier of Yard Stacks // included for easy reading
 YT // a single value giving the number of maximal allowed tier in yard stacks
 Number of Vessel Stacks// included for easy reading
 NVS // a single value giving the number of Vessel stacks
 Max Tier of Vessel Stacks // included for easy reading
 MTVi // NVS lines each on containing the maximal tier of vessel stack i
 Yard Bay // line included for easy reading
 // The following lines are repeated YS times for each yard stack
 Stack 0: // included for easy reading
 B_3 B_1 C_1 A_0 // A single line containing all the containers in the current stack. The container id has
 the form A_1 where the first letter indicates the vessel stack and the number the vessel stack tier

File naming convention:

In the zip file containers multiple files each one containing a single problem instance. For example

File

Bay-A-B-C-D_E.pro

Indicates that it is a problem instance for having

- A is the lowest value of maximal tier of all vessel stacks
- B is the number of vessel stacks,
- C is the number of stacks in the yard,
- D is the the maximal allowed tier in the yard and
- E is the value of the random seed used to generate the problem.

We have also included detailed results of applying different heuristics for the problem instance set as presented in article [***]. The results have the following naming convention

ProblemName_RelocHeuristic_SelectRetrive_UseOfCorrection_GRASP.txt

- ProblemName is the first part of the problem instance name (for example Bay-A-B-C-D)
- RelocHeuristic is an abbreviation of the relocation heuristic used. LT is for lowest tier, MM for MinMax, MMC is MinMax with consideration of cycles
- SelectRetrive is an abbreviation of the select retrieval heuristic. MBS minimal number of blocking container with consideration of well-located containers, MBEX minimal number of blocking container with consideration of well-located containers and cycle blockings
- UseOfCorrection is used to indicate if the correction procedure is used. F- full correction, N- no correction
- GRASP is used to indicated if the results show best values for a 100 runs of the algorithm have been performed. In case F is used this corresponds the the GRASP algorithm in the mentioned article.

Each file contains 40 lines the first value is the number of relocations the second one is execution time in milliseconds