Dear Editor and Reviewers,

We would like to express our gratitude for the great efforts that you and the anonymous referees have put in this paper. We found the suggestions are constructive. We have strived to address all the issues as thoroughly as possible. The main changes are summarized as follows:

1. We have integrated Section 5.2 (Valid task) and Section 5.3 (Task evaluation) together as Section 5.2 for better presentation structure. The integrated contents have not been changed and now are under Section 5.2.1 (Valid task) and Section 5.2.2 (Task evaluation), respectively.

2. We have added the comparison with a multi-heuristic approach and BS-B (a beam search which has the best performance by far) in Table 3, Table 4, and Table 5. As suggested by Referee 2, comparing with best values can give us an insight of how the heuristic performs.

3. We have revised typos and unclear presentations by our best effort.

We hope our revision meets your satisfaction, and we look forward to your favorable response shortly.

Regards,

Ning Wang

Bo Jin

Zizhen Zhang

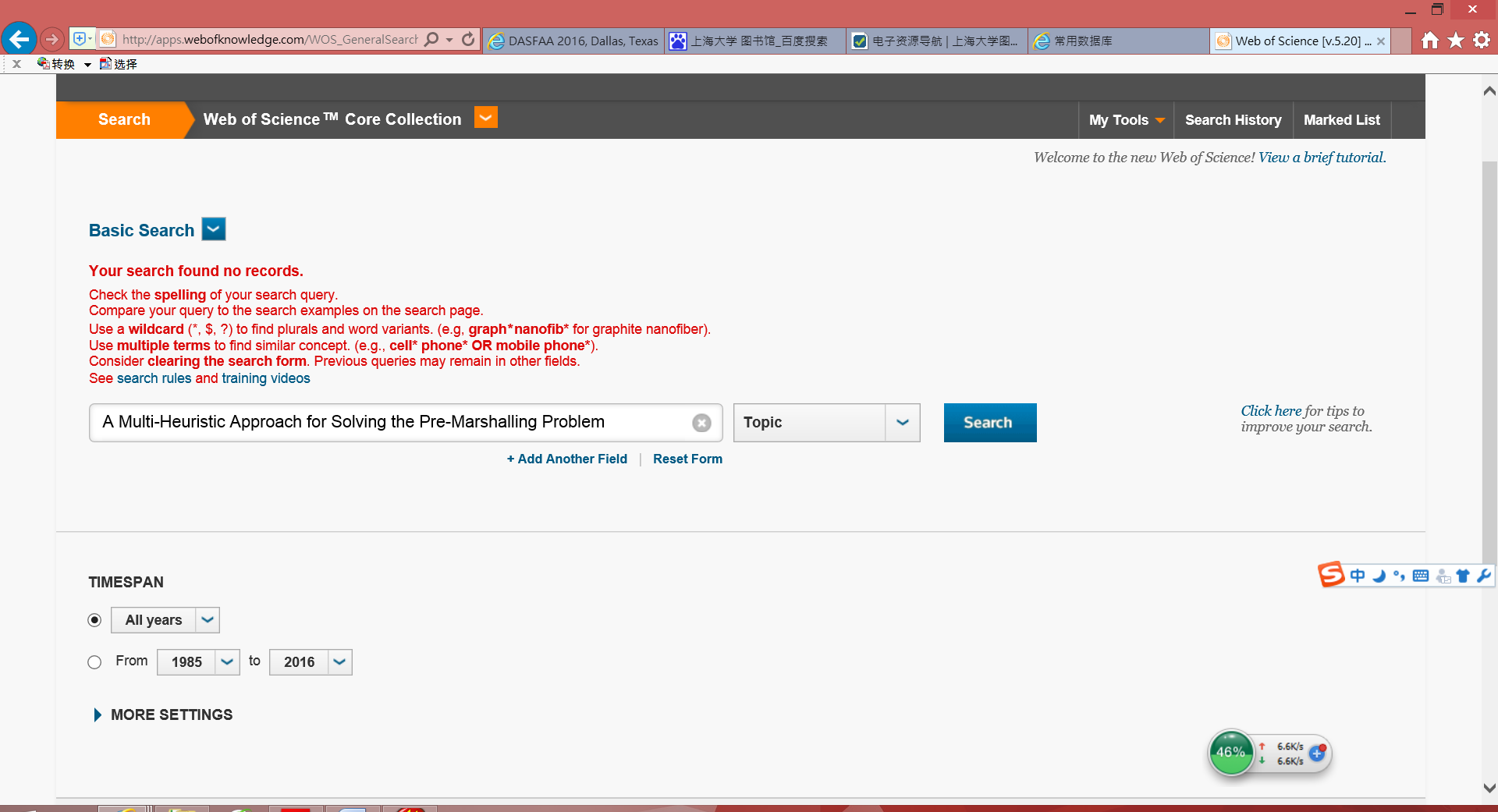
Andrew Lim

Reviewer#1

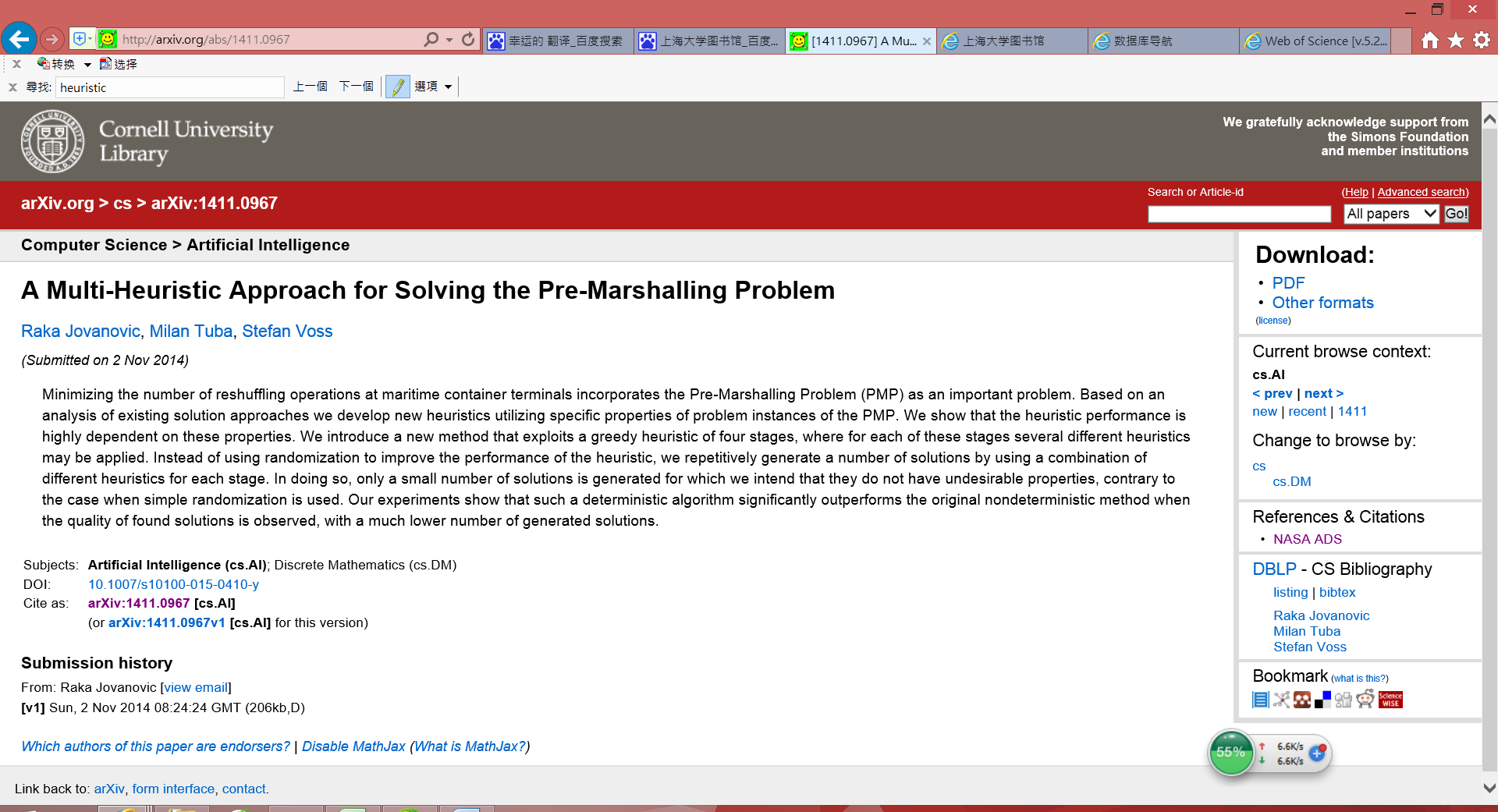
1. Along the text you indicate several times that this is the first paper in which the containers are not allocated following a pre-defined order. However, this idea is not novel. Please, check the paper 'A Multi-Heuristic Approach for Solving the Pre-Marshalling Problem' by R. Jovanovic et al. in IEEE Computational Intelligence Magazine. This paper must be considered appropriately in your computational experiments and the contributions of the paper.

Answer: We think the referee may misunderstand. We didn’t (intend to) indicate that we are the first one not to allocate containers in a pre-defined order. We just stated that we allocate containers not in a descending order of group values, and we are the first one to use feasibility check before branching. Allocating containers not complying with the descending order of group values makes the algorithm explore a larger solution space; we are the first one to use feasibility to cut useless branches.

We didn’t know the paper mentioned by the referee when we submitted our paper to EJOR. And we have kept tracing the newest update of that paper in IEEE Computational Intelligence Magazine, data base SCIE, and google scholar once we known from the referee. The last date we searched the paper mentioned by the referee is 2016-01-20. We didn’t find the paper published in IEEE Computational Intelligence Magazine (see the search result below).



But fortunately, we find a manuscript at http://arxiv.org/abs/1411.0967



We think the manuscript has most contents of the paper published on IEEE. Hence, we have referred to the experimental results of the manuscript and cited the manuscript in our literature review.

Our work makes three main contributions to the literature.

One contribution is the concept of feasibility. We quantitatively find a necessary condition for a feasible instance.

The feasibility of rearranging a certain container is checked before we actually conduct the rearrangement, which guarantees the search efficiency.

The time complexity of checking the feasibility is only *O*(*G*); here *G* is the number of groups. Our paper is the first work that uses feasibility to cut branches in CPMP algorithms.

The second contribution lies in the techniques proposed - stability, dead-end avoidance and tier-protection indicator, which better describe the statuses of layouts.

The third contribution is the improvement of single container rearrangement which is achieved based on the relationship between numbers of available slots and blocking containers. It avoids the situation where a target container is buried when relocating its blocking containers.

Explanation of bury of target container *c* and its solution

When the target container *c* (located at *s*+) and target stack *s\** are in different stacks, it may also occur a deadlock where not enough slots of S\{*s*+,*s*\*} are available for blocking containers and the slots below *c* must be used for placing blocking containers. Take the layout below as an example. Well relocating 9 (target container in gray background) to stack 2 is selected as the next task (actually most algorithms will select this task). Container 1 and 2 should be relocated but stack 3 has only one slot, not enough for two containers.

Our algorithm considers this situation and will put 9 on top of 6 temporarily. Container 1 and 2 are relocated to stack 1. Extant algorithms seldom consider placing containers of *s*\* to *s*+ by moving *c* to a temporary slot. At last 9 is moved to stack 2.

|  |  |  |  |
| --- | --- | --- | --- |
| 5 |  |  |  |
| 4 |  |  | 6 |
| 3 | ***9*** |  | 7 |
| 2 | 4 | 1 | 8 |
| 1 | 3 | 2 | 5 |
|  | 1 | 2 | 3 |

2. Minor comments:

- Abstract:  
  + (CPMP), which

  + improves the performance OF the

Answer: We didn’t find the terms pointed out by the referee. And we have rewritten the abstract.

  + It is not correct to say 'enlarged search space' due to the fact you are not considering any extension of it. Instead, most of previous papers have considered shorter versions of the search space.

Answer: We wrongly used “search space” to refer to “searched space by the algorithm”. We have revised the wrong presentations appeared in Abstract and Conclusion.

- Other application fields in which the optimization problem at hand can be applied must be suitably described.

Answer: we have mentioned other application fields (container relocation problem and container stacking problem) in the literature (the first paragraph of Section 2).

- A dot has been forgotten in the last paragraph of the introduction

- Replace 'effective' by 'efficient' in the first paragraph of Section 5

Answer: we have revised.

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Reviewer#2

1. On the one hand, the authors should take care that the literature review is (nearly) complete. There are some interesting new papers on the container pre-marshalling problem that should be cited:

1) A rule-based heuristic procedure for the container pre-marshalling problem. Gheith, M.S.; Eltawil, A.B.; Harraz, N.A. Industrial Engineering and Engineering Management (IEEM), 2014 IEEE International Conference, 9-12 Dec. 2014, DOI: 10.1109/IEEM.2014.7058721

2) Solving the container pre-marshalling problem using variable length genetic algorithms. Mohamed Gheith, Amr B. Eltawil, and Nermine A. Harraz. Engineering Optimization, 2015, http://dx.doi.org/10.1080/0305215X.2015.1031661

3) A branch and price procedure for the container premarshalling problem. Martijn van Brink and Ruben van der Zwaan

4) Solving the pre-marshalling problem to optimality with A\* and IDA\* (working paper) K Tierney, D Pacino, S Voß

Answer: We have added seven newly published papers in our new version, including the four papers suggested by the referee.

2. On the other hand, tables 3 and 4 with numerical results for the CVS and for the BF instances should also include columns with best known values (reached by other methods). This is necessary to estimate the quality level of the proposed constructive heuristic. It is clear that the constructive heuristic can be embedded later into a frame heuristic to improve the solution quality drastically. By the way: This motivation should be given not only at the end of the paper. In addition, I would doubt whether the FBH heuristic should be used solely (as mentioned in the conclusions).

Answer: We have added the results of BS-B in Table 3 and Table 4. BS-B is a beam search method using TGH to evaluate the attractiveness of branches. By far, it has the best performance.

We have explained the reason why we need to compare FBH with the best known values in the first paragraph of Section 6. In the old version, we said that FBH can be used with other framework in Section 5 and Section 7. Now we add such statements in Section 1 and Section 6.

We think that FBH can be used solely and other researchers also think that heuristics can be used solely (refer to 'A Multi-Heuristic Approach for Solving the Pre-Marshalling Problem' by R. Jovanovic et al.). From Table 3 and 4, it can be seen that BS-B takes more time. FBH is enough to solve on-line problems and small-size problems.

3. Minor remark:

Typos:

P. 3, l. 44, Section 4. Comprehensive ... (point missing)

Tables 3 and 4: write "moves" or "no. of moves" instead of "move".

Answer: we have revised these two typos.

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Reviewer3

Please, have a look at the following minor issues, mainly related to the language. Below, you will find a few examples. However, please review the entire manuscript to improve readability.  
  
- page 3 of the paper, line 44: "Comprehensive" -> capital "C" is not needed  
- page 13, line 47: "A more choice" should be "A better choice"  
- page 17, line 36: "it need consider..." I find sentences in lines 36-40 a bit confusing.  
- page 17, lines 38, 55, etc.: Have a look at the use of the full stops. I do not think they are appropriately placed.  
- page 27, line 39: "it can be discussed that how to..." -> remove "that"

Answer: we have asked an English editor to go through the entire paper carefully.

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Reviewer4

The authors have done a good job in improving the paper. I am now comfortable to recommend this manuscript be accepted for publication.

Nil