

**Subject:** Fw: TMECH-01-2020-9762 - Major Revision - Transactions on Mechatronics  
**From:** ywang24@zju.edu.cn  
**Date:** 21/02/2020, 4:48 pm  
**To:** Jaime.VallsMiro@uts.edu.au, 3140100721@zju.edu.cn

Dear Jaime and Tong,

Please see the TMECH comments below. I think we have to pay efforts to address several points from R1, and last point from R2.

Regards,  
Yue

-----原始邮件-----

发件人: "Transactions on Mechatronics" <[onbehalf@manuscriptcentral.com](mailto:onbehalf@manuscriptcentral.com)>  
发送时间: 2020-02-21 13:32:41 (星期五)  
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主题: TMECH-01-2020-9762 - Major Revision - Transactions on Mechatronics

21-Feb-2020

Dear Dr Wang:

Your manuscript submitted to the IEEE/ASME Transactions on Mechatronics,

ID: TMECH-01-2020-9762  
Title: Cellular Decomposition for Non-repetitive Coverage Task with Minimum Discontinuities  
Paper Type: AIM Concurrent Paper

has been reviewed by the Technical Editor and selected Reviewers. Their comments and suggestions are below and/or in separate files which may be accessed by going to your Author Center. On the basis of the reviewers' ratings and comments as well as the Technical Editor's recommendation, your manuscript in the present form cannot be published in the Transactions. However, you are encouraged to conduct a Major Revision to carefully address both the Technical Editor's and the reviewers' questions and concerns.

Please note that, as a TMECH/AIM Concurrent Submission paper, your revised manuscript has to be submitted no later than March 26, 2020, strictly following the page limit as specified in the Call For Paper. Please also note that the decision upon the completion of the next round of review process will be Provisional Accept or Reject.

Sincerely,

Dr. I-Ming Chen :: Professor :: Editor-in-Chief, IEEE/ASME Transactions on Mechatronics  
:: Fellow of Academy of Engineering, Singapore :: Fellow of IEEE :: Fellow of ASME ::  
School of Mechanical and Aerospace Engineering :: Nanyang Technological University :: 50  
Nanyang Ave, Singapore 639798

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Senior Editor: 1  
Comments to the Author:  
Please address reviewers' comments carefully and appropriately.

Please note that the decision for the next round of review would be either (Provisional)

Accept or Reject. No more revision would be allowed.

Technical Editor: 2

Comments to the Author:

The reviewers agree that the paper is interesting, although they have raised some major issues that need to be solved before publication. The revised version should be highly improved also in terms of clarity before possible acceptance.

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 REVIEWERS' SUGGESTIONS:

Reviewer: 1

WHAT ARE THE CONTRIBUTIONS OF THIS PAPER: This article investigates a cellular decomposition method for non-repetitive coverage task of manipulator. Concretely speaking, this method to optimally divide the workspace into the minimum number of cells, each traversable without discontinuities by any arbitrary coverage path within. In brief, the paper is not well written and the following suggestions need to be considered to improve the quality of the article.

1. As for the format of the paper, I think it is necessary to add keywords to the article so that readers can better understand the research contents.
2. The proposed method can be applied to mechanical polishing and painting in industrial production, so the current application methods in the assembly line of industrial production need to be introduced to enrich the research background with more references.
3. This manuscript always focuses on inverse kinematics and joint space, but in my opinion, only the trajectory of the end-effector is considered and divided into cells. Therefore, how to generate the solution of inverse kinematics (IK) is also very important. The authors should explain the control signal (joint angle or joint velocity).
4. When conducting simulations and experiments, it is generally necessary to give the parameters of the manipulator to increase the feasibility of the paper. In addition, the general UR5 manipulator is of six degrees of freedom (DOFs) or higher DOFs instead of five DOFs. Please add some description of the used manipulator.
5. Real world experiments in Section VI-C provides very little experimental process information. It is recommended to provide a link to the video of the experiment.
6. The comparisons in the article is not intuitive. I suggest the author to give a comparison of the energy consumption and time consumption of different methods when conducting the experiment, if possible.
7. There are some minor errors in the paper that need to be corrected. For example, In line 7 of Page 1, ``Member, IEEE,`` should be corrected as ``Member, IEEE,`` ; In line 2 Page 2, ``The remainder of this paper 1 is organised as follows`` should be corrected as ``The remainder of this paper is organised as follows``.
8. As opposed to non-repetitive path, the repetitive motion planning of manipulator is also very significant in industrial production. It is recommended that the authors can briefly compare the repetitivemotion planning task with the non-repetitive path task after referring to the following papers.
  - 1) A Data-Driven Cyclic-Motion Generation Scheme for Kinematic Control of Redundant Manipulators, IEEE Transactions Control System Technology, In Press.
  - 2) On Generalized RMP Scheme for Redundant Robot Manipulators Aided with Dynamic Neural Networks and Nonconvex Bound Constraints, IEEE Transactions on Industrial Informatics, 2019.

All in all, this paper is written in a mediocre way, and it is recommended that the authors should greatly improve the paper and submit it again.

Reviewer: 2

WHAT ARE THE CONTRIBUTIONS OF THIS PAPER: It is proposed that a mechanism to derive non-repetitive coverage path solutions with a proven minimal number of discontinuities, with the aim to avoid unnecessary, costly end effector lift-offs for manipulators. The two novel contributions of this paper include proof that the least number of path discontinuities is predicated on the surrounding environment, independent from the choice of the actual coverage path; thus has a minimum. And an efficient finite cellular decomposition method to optimally divide the workspace into the minimum number of cells, each traversable without discontinuities by any arbitrary coverage path within.

Reviewer: 3

WHAT ARE THE CONTRIBUTIONS OF THIS PAPER: 1) The paper presents a novel method of cellular decomposition by which a manipulator can perform a task in the workspace with minimum number discontinuities or lift offs of the End Effector.  
2) While dividing the workspace to number of cells for the task, they also proved that the number of discontinuities or lift offs are not affected by the type of coverage path adopted.  
3) They have also shown the application of it through simulation and a real world experiment with a manipulator.

Reviewer: 1

WHAT ARE SOME WAYS IN WHICH THE PAPER COULD BE IMPROVED: This article investigates a cellular decomposition method for non-repetitive coverage task of manipulator. Concretely speaking, this method to optimally divide the workspace into the minimum number of cells, each traversable without discontinuities by any arbitrary coverage path within. In brief, the paper is not well written and the following suggestions need to be considered to improve the quality of the article.

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Reviewer: 2

WHAT ARE SOME WAYS IN WHICH THE PAPER COULD BE IMPROVED: 1) Clear scientific problems, combining with the actual problem, not only mathematical model;  
2) The language needs to be easy to understand

Reviewer: 3

WHAT ARE SOME WAYS IN WHICH THE PAPER COULD BE IMPROVED: 1) For different topological graphs different configurations are chosen. I would like to know how these configurations are chosen? Is it that there are a number of solutions of configurations to cover the cells and any one is chosen or there is really a unique solution of a

configuration.

2) I would also appreciate a flow chart kind of thing starting from assignment of the task to the execution of the task by the robot to be there. Right now, it is not so clear. That would make it complete.

3) I would also like to know if the entire thing can be automated or not? End to end. A brief description about this will be helpful.

4) There are many grammatical errors in the paper. I have highlighted a few in red as you will find in the attached paper. Please address them also.

Reviewer: 1

#### Comments to the Author

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All in all, this paper is written in a mediocre way, and it is recommended that the authors should greatly improve the paper and submit it again.

Reviewer: 2

#### Comments to the Author

1) The research background needs to be more clear. It needs to extract the scientific problems to be solved, point out the problems of the existing solutions, and then draw

the content of the paper to be studied.

- 2) Combined with actual application scenarios, rather than directly abstracting into a mathematical model, it needs to be realistic
- 3) Language should be easy to understand, not too much advanced vocabulary
- 4) The experiment should be further improved to prove the algorithm, not a simple pot surface polishing

Reviewer: 3

Comments to the Author

Dear Authors,

I should say that it is a very good work. Following are my observations:

- 1) For different topological graphs different configurations are chosen. I would like to know how these configurations are chosen? Is it that there are a number of solutions of configurations to cover the cells and any one is chosen or there is really a unique solution of a configuration.
- 2) I would also appreciate a flow chart kind of thing starting from assignment of the task to the execution of the task by the robot to be there. Right now, it is not so clear. That would make it complete.
- 3) I would also like to know if the entire thing can be automated or not? End to end. A brief description about this will be helpful.
- 4) There are many grammatical errors in the paper. I have highlighted a few in red as you will find in the attached paper. Please address them also.

I have also asked a few more questions in the attached file and highlighted some of the grammatical errors. I would suggest you to please go through the manuscript thoroughly.