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Number	21-2690 (ID 21-2690)
Title	Optimal Task-space Tracking with Minimum Manipulator Reconfiguration
Authors	Yang, Tong (255613), Valls Miro, Jaime (106478), Wang, Yue* (156231), Xiong, Rong (113216)
Current version	1
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Required action by the corresponding author	Resubmit not later than January 17, 2022
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Reviews of Version 1. Reviewed for publication as Submission for RA-L and ICRA			
Review ID	Reviewer number	Comments to the author	Attachment
183889	5	The paper explores finding a minimal sequence of joint configurations that enable a robot to track a task space trajectory, where the sequence of joint configurations enable jumping between different task space manifolds (i.e., moving around singularities). A RRT like planner is used to switch from one joint configuration to the next configuration. The paper focuses on finding optimal solutions where optimality is defined as the number of switches. This leads to many possible solutions that satisfy optimality. The paper is addressing an important problem and I enjoyed reading the proposed solution. One major issue I found with the paper is that the proposed solution does not account for the path taken by the RRT during the switches. This could lead to sub-par performance, affecting the cycle time and the total path length which were the initial motivations for the paper as mentioned in the introduction. I think incorporating the rrt-path in the algorithm is not trivial and could in itself be a research paper. For this submission, it would be good to run some experiments in highly constrained environments to see if the total path length (joint-space) is different across many optimal solutions produced by the proposed method. Specifically reporting the path length during the task space tracking and rrt-path for switching separately will be very insightful. Additionally reporting time taken on the real robot will help show the improvement with the proposed method. Some minor comments: 1. The paper mentions a supplementary video which was not submitted. 2. Having a table for the different variables used will be helpful as I was confused by some variables initially (e.g., difference between D, S). 3. In fig.5 and 6, the grey trajectory (rrt path) could be shown with a dotted line to improve visual clarity.	

187907	6	The authors propose to address the issue of handling robot joint reconfiguration during pose trajectory following for 6 DoF robots. The general issue is that when following a full end-effector pose trajectory with a non-redundant arm, the manipulator periodically reaches states where a continuous joint angle trajectory is not possible due to robot kinematic limits, obstacles, etc. The robot has to then detect such cases, and engage in joint space reconfigurations to continue following the pose trajectory. Applications include industrial processes like welding and painting. The authors develop an algorithm for globally minimizing the number of reconfigurations during pose trajectory following as a way of improving behavior during these unavoidable maneuvers. The authors test on a few cases showing how the optimization process does indeed reduce the number of configurations as opposed to a randomly selection baseline. The main question I have regarding the approach is whether solving for the minimum number of reconfigurations actually guarantees improvement over the performance metrics cited, i.e., reducing workspace volume requirements, reducing motion times and energy cost. It's true that their approach reduces the number of reconfigurations, but the results also show that the random baseline can produce more reconfigurations with less workspace volume (see Case 2). I also found the execution times for maneuvers of the random baseline to be competitive at times with the optimized solution. To address the above issue, I would recommend evaluating across a much larger number of cases, where the 3D convex hull of motion, execution time, etc. are reported and compared between the proposed solution and the baseline random one. I didn't see these metrics reported even for the current experiments even though the interest was in optimizing them. The paper is generally well written and the figures are nice. However, there are spelling errors throughout that need to be fixed. Overall, the algorithm is enticing and definitely relevant to the field, especially industrial robotics.	

Publication decision on Version 1 — December 18, 2021 09:13:17 Pacific Time

Decision	Revise and resubmit
Cover message	Dear Prof. Yue Wang, Your paper 21-2690 "Optimal Task-space Tracking with Minimum Manipulator Reconfiguration" by Tong Yang, Jaime Valls Miro, Yue Wang, Rong Xiong Submission for RA-L and ICRA submitted to the IEEE Robotics and Automation Letters (RA-L) has been reviewed by the Associate Editor and selected Reviewers. The reviews of the paper are attached. On the basis of the reviewers' ratings and comments, we decided that your paper cannot be published in the Letters in the present form. However, you are encouraged to rewrite and resubmit a revised version of your work addressing all editorial concerns. Please notice that there is a STRICT deadline of one month (30 DAYS) from today for you to resubmit a revised version, along with a Statement of Changes as a single pdf file indicating how comments by the Editor and by reviewers have been addressed and a list of changes made in the paper. The deadline is at 11:59 pm Pacific Time on the date specified. Please be aware that failure to meet the 30 days deadline implies that the paper will be automatically moved to the Reject category. Also notice that the next decision on this manuscript will be final, i.e. either Accept for Publication or Reject. Unfortunately, the tight timeline of the Letters will allow no extensions or exceptions to these rules. If you have any related concern, do not hesitate to contact me. Sincerely, Stephen J. Guy Editor (Planning and Simulation 1)

	IEEE Robotics and Automation Letters
Report	The authors have proposed a method for finding a joint space trajectory for following a task-space trajectory. The reviewers thought the work was good and interesting, but there were some gaps in the experiments that should be resolved before the final version.