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Dear Henk,

Please, find enclosed the revision of the manuscript entitled *Distributed tree rearrangements for reachability and robust connectivity* submitted to the SIAM Journal on Control and Optimization. We appreciated the thoughtful and constructive comments of the associate editor and the reviewers on how to improve the paper.

Below, we provide a detailed list of the changes that have been made in the revised versions according to the reviewers' observations.

We look forward to hearing from you soon. Sincerely yours,

Michael Schuresko and Jorge Cortés

Statement of revision

In the following, we provide a detailed account of all the changes made in the revised version of the paper. We have structured this list in separate blocks, corresponding to the suggestions made by the associate editor and the various referees.

Comments by Associate Editor

[AE: 1] "The authors should consider: (1) organizing the literature review and some statements in the Introduction as suggested be reviewer 1"

We have reorganized the literature review of the introduction and modified the statements of the introduction pointed out by the reviewer. We believe the revised version allows the reader to better distinguish the contributions of the work with respect to prior literature.

[AE: 2] "The authors should consider: (2) address the two remaining technical clarifications required by the reviewers"

We have addressed the two technical clarifications raised by the reviewers. Specific details are given in the answer below.

Comments by Referee 1

[R1: 1] "The only concern that remains is related to organization of the literature review and the contributions of this work; which can be inferred by reading throughout the paper, but the reviewer believes that they are still not clearly stated in the introduction."

We have organized the literature review and clarified our statement of contributions in line with the reviewer's suggestions.

[R1: 2] "In particular, the literature review reads as list of papers without much organization in terms of the properties of the proposed solutions, eg., robust vs non robust, restrictive vs least restrictive, task specific vs general, or the approach itself, eg., centralized vs distributed, continuous vs hybrid vs discrete. The reviewer believes that organizing the literature would help distinguish the contributions of this work with respect to prior literature, which is admittedly large, and locate this paper in some class of approaches."

We have reorganized and completely re-written the literature review portion of the introduction following the recommendation of the reviewer. We have also made explicit where exactly the present paper fits within the different approaches identified in the literature.

[R1: 3] "Also, the sentence "Finally, we believe our statement of distributed reachability to be unique among the works in the field." at the end of the literature review in the introduction should be mentioned earlier in this section, and "distributed reachability" should be defined (in words). Is the distributed reachability statement unique/novel as a solution technique or is it unique because it allows broader applicability of this work (with respect to other approaches)?"

We have followed this suggestion by moving this statement to the third paragraph of the introduction and defining the meaning of distributed reachability. At the end of the literature review, where we place our algorithm within all the approaches of the literature, we come back to this property and explain that the distributed reachability statement is unique/novel because it allows broader applicability of the work with respect to other approaches.

[R1:4] "The first sentence in the 3rd paragraph of the introduction: "The proposed algorithm is modular in a way which allows easy combination with motion coordination algorithms designed to achieve a variety of tasks, such as rendezvous, deployment, flocking or point-to-point reconfiguration." creates the impression that distributed reachability is a property of the algorithm that allows it to guarantee accomplishment of ANY task."

We have reformatted the sentence in the statement of contributions mentioned by the reviewer to clarify the discussion. This sentence does not allude to the distributed reachability property but to its modularity. The point we want to emphasize here is the fact that the proposed connectivity maintenance algorithm is formulated in a way that facilitates its combination with motion planning algorithms (which are designed to achieve some coordination task and by themselves do not necessarily guarantee connectivity preservation).

[R1:5] "...However, in Section 3.4, it is said that reachability involves spanning trees that are subgraphs of a given communication graph. In principle, any spanning tree (that is not a subgraph of a given communication network) can be reached by using the proposed approach and appropriately choosing the sequence of target spanning trees in a dynamically changing communication network. This sequence of spanning trees would normally depend on the desired task and if not appropriately chosen, it would result in a network topology that would still be somewhat constrained in achieving some desired task (the approach would be least restrictive, but not unrestricted). This point should be clarified in the introduction, since it is directly related to the contributions of this work. The reviewer believes that this point also distinguishes this work form other similar works such as: Zavlanos and Pappas, Distributed connectivity control of mobile networks, IEEE Transactions on Robotics, 2008, which is also distributed and least restrictive, but considers task completion a "secondary objective" (it has been shown though to successfully guarantee flocking in: Zavlanos, Tanner, Jadbabaie and Pappas, Hybrid control for connectivity preserving flocking, IEEE Transactions on Automatic Control, 2009)."

Thanks for bringing up this point. We have added a paragraph in the statement of contributions portion of the introduction to make this point clear following the reviewer's suggestion. We now emphasize that it is the motion planning algorithm that is guiding, in a dynamic way, the preferences for the links in the constraint tree and that, in general, the optimal operation of the resulting algorithm is not guaranteed, but needs to be analyzed on case by case basis.

Comments by Referee 2

[R2:1] "One final comment: on page 6 (in Subsection 3.1) and elsewhere in the paper the authors mention that "the reason for using a tree is that it has the minimal number of edges (hence posing as few constraints as possible)." This statement is not technically correct in the case of graphs generated by physical proximity between different agents, as in such graphs edges are not independent from one another. Put differently, not all trees are created equal, and some of them might put more constraints on the motion of the robots (compare a star with a tree). Obviously, this does not affect the importance of the algorithm suggested by the authors. However, I suggest the authors clarify this point (maybe even in an example)."

As suggested by the reviewer, we have clarified this point in Section 3. We now observe that the constraint tree is selected according to the preferences provided by the motion coordination algorithm, and also remark in the text that a network with the least number of constraints is not necessarily the least constrained network. Please see also answer to [R1:5].