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Reply

Orientation Control System: Enhancing Aerial Maneuvers for Quadruped Robots

Francesco Roscia [1], Andrea Cumerlotti [1,2], Andrea Del Prete [2], Claudio Semini [1] and Michele Focchi[1,3,*]

[1] Dynamic Legged Systems (DLS) lab, Istituto Italiano di Tecnologia (IIT), Genoa, Italy
[2] Industrial Engineering Department (DII), University of Trento, Trento, Italy
[3] Department of Information Engineering and Computer Science (DISI), University of Trento, Trento, Italy
* Correspondence: michele.focchi@unitn.it

Dear Reviewer,

Thank you for giving us the chance to submit a revised draft version of the manuscript titled "Orientation Control System: Enhancing Aerial Maneuvers for Quadruped Robots" to the MDPI journal *Sensors*. We are grateful for the time and the effort you and the other reviewers have dedicated to providing insightful comments on the original manuscript. We have incorporated changes to reflect most of the provided suggestions: they are highlighted in red within the manuscript.

Here is a point-by-point response to your comments and concerns.

- **Comment 1:** *Extend the text of the manuscript (e.g. introduction or conclusion) with specific results in the world and Europe, - Improve the quality of the paper by presenting the results of publications by researchers and experts who are involved in this field and registered in world databases (wos). These are e.g: Measurement of industrial robot pose repeatability, Investigation of snake robot locomotion possibilities in a pipe, thanks.*
  Response: Thank you for this advice. However, in the case of our study, it seems slightly out of range because we tackle the angular dynamics of the main body of a quadruped robot, that is observable. Thank you for having recommended us wos. The suggested papers seem a bit beyond of our topic. Nevertheless, we found on wos a relevant work about morphable 3d tail for quadruped robots [An, 2022], that we included on our manuscript.

- **Comment 2:** *Figure 4 should be contrasting and readable*
  Response: Thank you for pointing this out. We have incorporated your suggestion in the revised manuscript.

- **Comment 3:** *Conclusions and future work should be extended to contain practical applications based on research described in this paper - expand references.*
  Response: We are glad you made such an important hint to improve the quality of the manuscript. Possible applications of the presented OCS include but are not limited to efficiently adjust the posture of quadruped robots walking or jumping on uneven terrains. As proved in the third simulation (back-flip), our approach improves the capabilities of quadrupeds in space applications enabling fast locomotion by means of leaps, ensuring a reactive control action on the robot angular momentum. Furthermore, the method presented in Section 3 for designing the OCS does not depend on the specific platform, thus it can be replicated for reorienting mechanical structures with different morphology, e.g, monopods or bipeds. A construction worker's backpack can contain two flywheels with incident rotation axes: in the event of a fall from scaffolding, they can be used to reorient the human body to avoid the impact of the head with the ground with the same controller proposed in this work.
  We also expanded the number of references, please refer to Comment 5 below.

Citation: Roscia, F.; Cumerlotti, A.; Del Prete, A., Semini, C.; Focchi, M. Orientation Control System: Enhancing Aerial Maneuvers for Quadruped Robots. *Sensors* **2022**, *1*, 0. https://doi.org/

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- **Comment 4:** *Number all mathematical equations*
  Response: Thank you for bringing this to our attention. We applied the comment into the document.

- **Comment 5:** *For article type, 20 references are not enough. Please add more references (>20) during your revisions.*
  Response: We really appreciate your suggestion, which helped us to improve the manuscript. We included other relevant works in the literature review, e.g. [An, 2022], [Tang, 2022], and [Kurtz, 2022].

- **Comment 6:** *Standardization of literature input (into one style)*
  Response: Agree. We have corrected the literature input.

In addition to the above observations, all orthographic and grammatical errors mentioned have been corrected.

We look forward to hear regarding our submission and to respond to any further questions and comments.

Sincerely,
Michele Focchi, Ph.D.