

Response to Reviewer 1

Dear Reviewer:

Thank you for your warm help and the valuable comments concerning our manuscript entitled “Robust Adaptive Backstepping Motion Control of Underwater Cable-Driven Parallel Mechanism Using Improved Linear Model Predictive Control” (Manuscript ID: jmse-2421321). Your comments are all very helpful and valuable for revising and improving our paper, and also provide significant guidance for our future research. We have studied the comments and made revisions according to the suggestions carefully, hoping to meet with approval. The main revisions made to the manuscript have been marked up using the “Track Changes” function, so that they can be easily viewed.

The main revisions and the detailed responses to your comments are as follows:

Point 1: The motivation and background of wide practical use of the theoretic results presented should be clearly emphasized to facilitate the readers. What are the underlying factors that led to better performance of the proposed method?

Response 1: Thank you very much for your reminder. I have emphasized the motivation and background for the widespread application of my proposed theoretical results from Line 115 to Line 122, and Line 342 to Line 349. I have also analyzed the fundamental reasons why my method performs well.

Point 2: In simulations, how to select the control parameters in controller? How the full-state constraints are chosen? It is better to explain how the values of the control parameters in the proposed method are adjusted?

Response 2: Thank you very much for your reminder. The parameters that affect the simulation results in this article are mainly distributed in four parts: the factors $k_{s,inf}$, $k_{v,inf}$, and K_{cf} in DMPC; K_Y and K_U in LMPC; the control parameters in the X-swapping method, and the closed-loop control parameters of the winch. The selection process of these parameters is as follows:

- (1) The selection process of factors $k_{s,inf}$, $k_{v,inf}$, and K_{cf} in DMPC is described explicitly in Line 325 to Line 332, Line 342 to Line 349;
- (2) The selection process of parameters K_Y and K_U is described explicitly in Line 790 to Line 803;
- (3) The selection process of parameters in the X-swapping method is described explicitly in Line 563 to Line 565;
- (4) The parameters of closed-loop control parameters of the winch are selected by trial and error to optimize tracking accuracy, which is written in Line 563.

Point 3: More results are welcome-ed. The reviewer would like to suggest the authors compare, if possible, their results with some recently published work and clearly show the new design features in the current work.

Response 3: Thank you very much for your reminder. In order to increase the effectiveness of the proposed method in this article, I compared the research method with the method in reference [29], published in 2022. The differences between my work with [29] are detailed in Remark 4 (Line 598 – Line 610). In contrast, the comparison results are shown in Figure 7(e) and (f), Figure 8 (e) and (f), and Table 6, 11,12,13,14. Based on the comparison results, we can more confidently propose the following viewpoints:

- (1) Dynamically adjusting the minimum tension of the cable can effectively improve the adaptability of the system under different motion states, ensuring the control accuracy of the platform;
- (2) A system with an improved LMPC method can have minor maximum cable tension, larger workspace, and smaller cable tension fluctuation, all of which can effectively improve the control accuracy of the platform and improve equipment safety and control range.

Point 4: The results discussion section is rather short. The explanations and analysis of the results should be enriched to show the validity of the data. More discussions should be given to clearly demonstrate the limitations/validity of the obtained results.

Response 4: Thank you very much for your reminder. I have added analysis and interpretation of the experimental results. The specific content is shown in Chapter C, Section 4.

Point 5: To demonstrate the efficacy of the proposed control system in real-world scenarios, it would be beneficial to include experimental results, if available.

Response 5: Thank you very much for your reminder. Unfortunately, the experiment is still in preparation, and the results are unavailable. The explain is written in Line 523.

Point 6: The presentation of the manuscript can be improved and the quality of some figures can be enhanced.

Response 6: Thank you very much for your reminder. I have redrawn some figures, such as Figure 6, to make it easier for readers to understand.

Point 7: There are some typos in the manuscript. The authors should check the whole manuscript to avoid some grammatical mistakes.

Response 7: Thank you very much for your reminder. I have conducted a detailed review of the article.

We have tried our best to improve the manuscript according to your valuable comments. We really appreciate for your warm help. We hope that the revisions will meet your approval.

Thank you and best regards.

Sincerely yours,

Jiafeng Zhao