

Reviewer 1: Comments and Suggestions

- 1. In (18), the modeled human force is not fit for reality. First, it should contain acceleration information. Second the gains K_h and B_h are usually variable and unknown.**

Response: For our simulations, we adopted the human force that has a spring-damper model of the human arm modeled as a proportional derivative (PD) position tracking controller from [36,49,50].

In literature, the damping constant B_h , and spring constant K_h used for simulation were set to 75N/m and 50N/m respectively [36,49,50].

[36,49,50] are references in our revised manuscript.

- 2. The authors manually set a high and low cutoff frequency of 2Hz and 0.5Hz respectively, giving a corresponding ω_{c1} and ω_{c2} of 12.57 rad/sec and 3.14 rad/sec respectively. Why? The authors should mathematically prove a range that can offer the system best performance. Otherwise, simply setting a number makes the contribution too vague. After all the proposed filter is just a first order low-pass filter plus a first-order high-pass filter.**

Response: In the manuscript we first submitted, on page 10 we stated that “The cutoff frequencies occur at about 10% of the maximum magnitude of the reflected signal”.

However, in our revision, we have added the following to page 9 of our revised manuscript to further explain how we determine the cutoff frequencies. “To determine the cutoff frequencies, we tested several percentages of the maximum magnitude of the reflected signal, ranging from 5% to 15%. However, 10% of the maximum magnitude of the reflected signal produced cutoff frequencies that alleviate wave reflections without the loss of important signals.”

- 3. Since the wave variable method is used to deal with large time delays. The authors should provide more experiment results on different delays. Especially, the delays in worst case ($>2s$) should be considered.**

Response: We have added the following simulated results to our revised manuscript.

- Simulation result of 500 milliseconds time delay in Figure 7 (See page 11)
- Simulation result of 5 seconds time delay is illustrated in Figure 8. (See page 12)

- 4. The references are not enough.**

Response: We have added the 11 references to our revised manuscript including the 5 recommended by the reviewer.

1. Application of wave-variable control to bilateral teleoperation systems: A survey. Annual Reviews in Control, 38(1), 12-31. (See [32] on page 2)
2. Reducing wave-based teleoperator reflections for unknown environments. IEEE Transactions on Industrial Electronics, 58(2), 392-397. (See [40] on page 2)

3. A novel approach for stability and transparency control of nonlinear bilateral teleoperation system with time delays. *Control Engineering Practice*, 47, 15-27. (See [41] on page 2)
4. Improving haptic feedback fidelity in wave-variable-based teleoperation orientated to telemedical applications. *IEEE Transactions on Instrumentation and Measurement*, 58(8), 2847–2855. (See [47] on page 3)
5. Bilateral teleoperation with reducing wave-based reflections. *Advances in Manufacturing*, 1(3), 288–292. (See [42] on page 2)
6. Shukla, S.; Singh, P.; Behera, L. A passivity based system design for non-holonomic mobile robot in presence of delay and traffic disturbances. In *Proceedings of 2017 12th IEEE Conference on Industrial Electronics and Applications* (See [26] on page 2)
7. Chen, B.; Guo, Y.; Wu, Y. Comparative Study of Wave-Variables and Smith Predictor for Teleoperator Force-Position Control. In *Proceedings of 2019 Chinese Control And Decision Conference* (See [27] on page 2)
8. Shahzad, A.; Roth, H. Bilateral telecontrol of AutoMerlin mobile robot with fix communication delay. In *Proceedings of 2016 IEEE International Conference on Automation, Quality and Testing, Robotics* (See [28] on page 2)
9. Huang, J.-C.; Wu, C.-I.; Chang, Y.-H.; Lin, H.-W.; Wu, C.-T.; Lee, S.-T. Design and implementation of wave variable based teleoperation systems. In *Proceedings of 2010 International Conference on System Science and Engineering*; pp. 304-309. (See [33] on page 2)
10. Tian, D.; Yashiro, D.; Ohnishi, K. Frequency-domain analysis of wave variable based teleoperation and its equivalent implementation. In *Proceedings of 2011 1st International Symposium on Access Spaces (ISAS)*; pp. 41-46. (See [34] on page 2)
11. Ye, Y.; Liu, P.X. Improving Trajectory Tracking in Wave-Variable-Based Teleoperation. *IEEE/ASME Transactions on Mechatronics* 2010, 15, 321-326 (See [49] on page 8)