User Experience with Semi-Natural Locomotion Techniques in Virtual Reality: The Case of the Virtuix Omni

Lawrence E. Warren
Dept. of Computer Science and Center for
Human-Computer Interaction
Virginia Tech, USA
lwarren@vt.edu

Doug A. Bowman
Dept. of Computer Science and Center for
Human-Computer Interaction
Virginia Tech, USA
dbowman@vt.edu

CCS CONCEPTS

• **Human-centered computing → Interaction devices**;

KEYWORDS

Interaction fidelity, locomotion, virtual reality, user experience

1 INTRODUCTION

Prior studies have shown that semi-natural VR locomotion techniques (i.e., those with moderate levels of interaction fidelity) can produce an inferior user experience compared to both real walking and non-natural locomotion techniques [1], but it is not known whether all semi-natural VR locomotion interfaces suffer from the same problems. The Virtuix Omni is a commercial VR locomotion device in which users strap into a harness that supports the lower body and perform walking motions on a low-friction curved floor. Our analysis of the Omni indicated that while it still falls in the semi-natural category, it may have some advantages compared to prior semi-natural devices. We conducted a study to evaluate user experience with the Omni in order to determine whether the Omni avoids the user experience problems seen in other moderate-fidelity techniques.

2 EXPERIMENT

Our experiment evaluated user experience with a standard game controller locomotion technique and the Omni. With both techniques, users stood inside the Omni frame while wearing a tracked Oculus Rift CV1 HMD.

After a training session, participants were asked to perform several locomotion tasks. We collected data on path deviation as a measure of control, wall collisions during a speed run as a measure of accuracy, and angular pointing error when remembering previously seen objects as a measure of spatial orientation. In addition, we gathered subjective user experience data from questionnaires. Ten participants (all male) 18-24 years of age completed the study.

Key findings from the study included:

- Participants expected the Omni to perform better than the controller.
- Only the most difficult path following task resulted in significantly more deviation by the Omni.
- The Omni was significantly worse than the controller for negative affect.

3 DISCUSSION AND CONCLUSION

Overall, we found few objective differences in task performance between the Omni and the controller. Considering the subjective measures, however, we conclude that the game controller still provides a better user experience than the Omni overall. While the Omni was seen as more natural and more fun, the requirement to wear an uncomfortable harness, the difficulty in turning while walking, and the sense of fatigue after only a short usage session caused participants to prefer the Omni.

This study adds evidence to support the hypothesis that semi natural locomotion techniques can result in an inferior user experience compared to well-designed low-fidelity techniques. At the same time, our results suggest that semi-natural devices with increased fidelity can improve both performance and subjective experience. We plan to explore new locomotion interfaces with even higher interaction fidelity in an attempt to escape the "uncanny valley" and provide a better VR walking experience.

ACKNOWLEDGMENTS

REFERENCES

[1] Mahdi Nabiyouni, Ayshwarya Saktheeswaran, Doug A Bowman, and Ambika Karanth. 2015. Comparing the performance of natural, semi-natural, and non-natural locomotion techniques in virtual reality. In *3D User Interfaces (3DUI), 2015 IEEE Symposium on*. IEEE, 3–10.