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Exploring Bimanual Haptic Feedback for Spatial Search in Virtual Reality

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摘要

- We explored bimanual haptic feedback with various combinations of haptic properties, where four types of bimanual haptic feedback were designed, for spatial search tasks in VR.
- Two experiments were designed to evaluate the effectiveness of bimanual haptic feedback on spatial direction guidance and search in VR.

问题

- Traditional methods to enhance the performance of spatial search often employ sensory cues such as visual, auditory, or haptic feedback.
- But the design and use of bimanual haptic feedback with two VR controllers for spatial search in VR remains largely unexplored.

方法

- Four bimanual haptic feedback patterns based on different combinations of vibration type, intensity, and duration(Fig. 1).

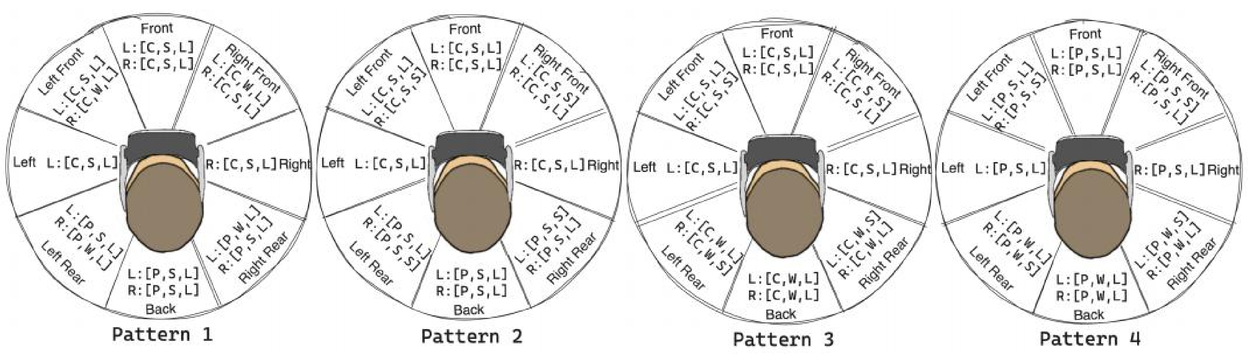

Fig. 1 Four types of bimanual haptic feedback patterns

- Experiment 1(Fig. 2) compared bimanual haptic feedback with spatial audio feedback.
- Experiment 2(Fig. 3) compared bimanual haptic feedback with no additional feedback, visual arrow, and unimanual haptic feedback(Fig. 4).

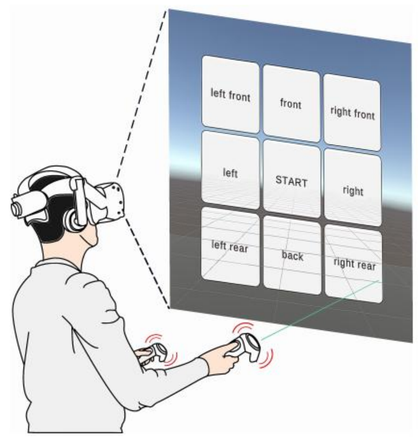

Fig. 2 Virtual scene for Experiment 1

Fig. 3 Virtual scene for Experiment 2

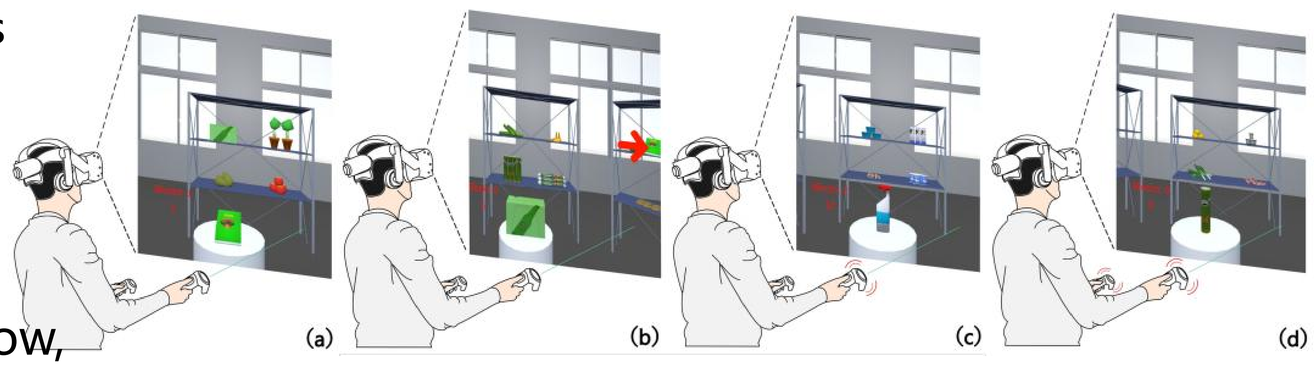

Fig. 4 Feedback conditions in Experiment 2

实验结果

- **Experiment 1:** Bimanual haptic feedback achieves significant improvements in accuracy and speed compared to spatial auditory feedback.

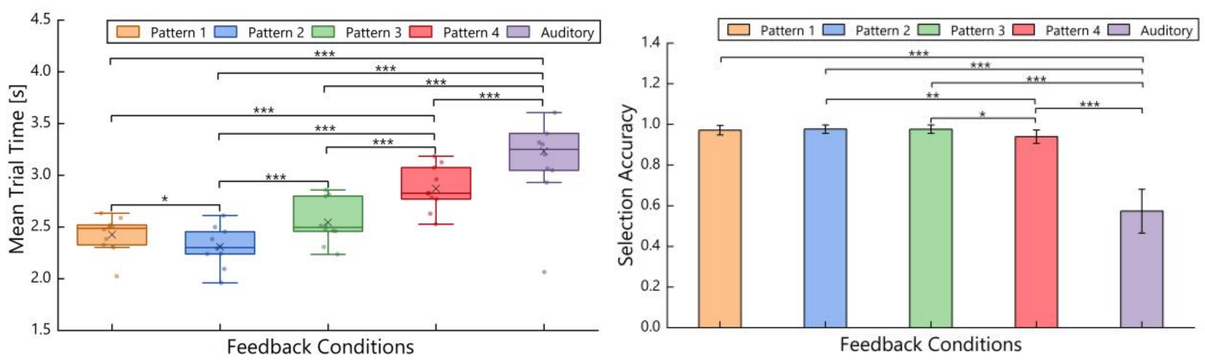

Fig. 5 Result Graphs of Experiment 1

- **Experiment 2:** Bimanual haptic feedback performed comparably as the visual arrow, and even performed better in directions behind the user.(Fig. 6).

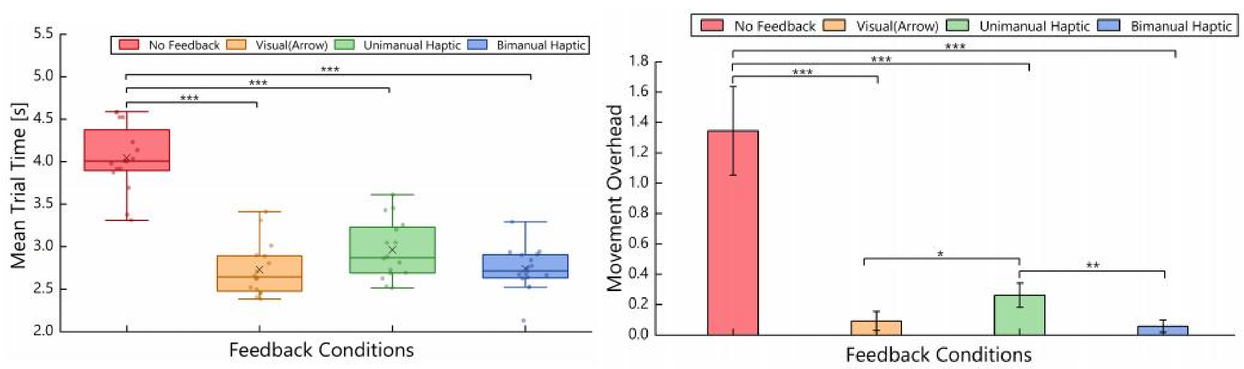

Fig. 6 Result Graphs of Experiment 2