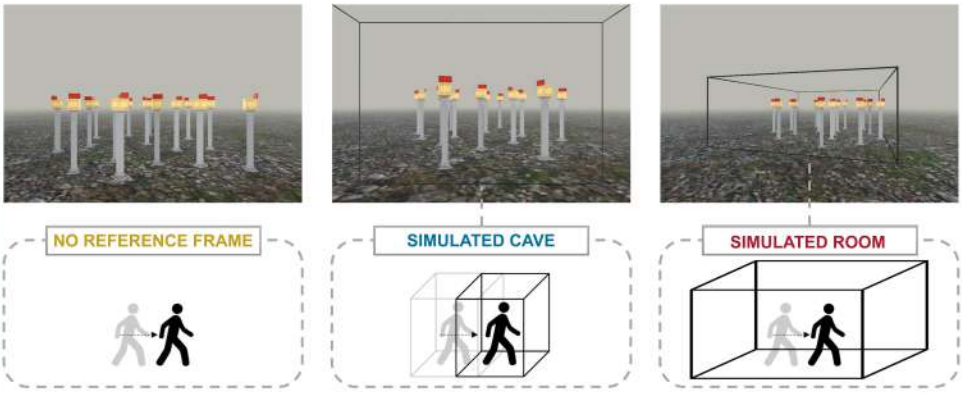
MOVING IN A BOX

IMPROVING SPATIAL ORIENTATION IN VR USING SIMULATED REFERENCE FRAMES

Thinh Nguyen-Vo Bernhard E. Riecke Wolfgang Stuerzlinger
School of Interactive Arts + Technology, Simon Fraser University, BC, Canada

MOTIVATION

When people navigate in an environment, a representation of their physical location and orientation is formed and continuously updated. This representation is referred to as reference frame. **To enable more effective locomotion in VR, we proposed using an overlaid wire-frame of a 3D rectangular box to simulate frames of reference.**



METHOD

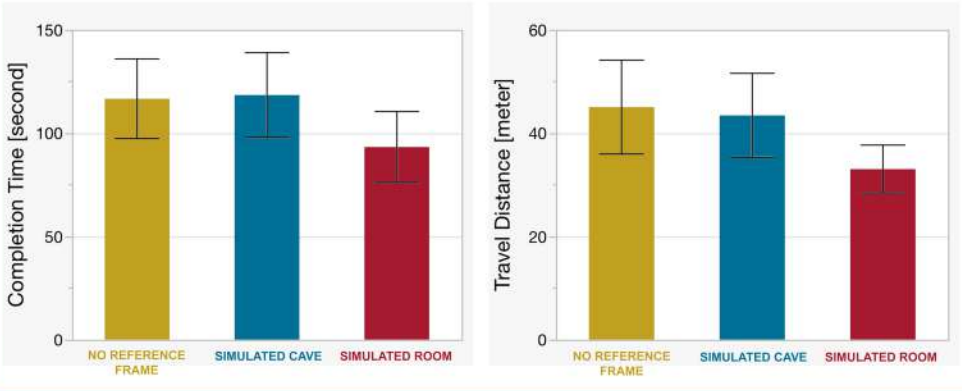
Participants: 27 volunteers

Experimental design: within-subjects

Task: Navigating through a virtual environment to find 8 target objects hidden in 16 boxes

Display: HTC Vive HMD

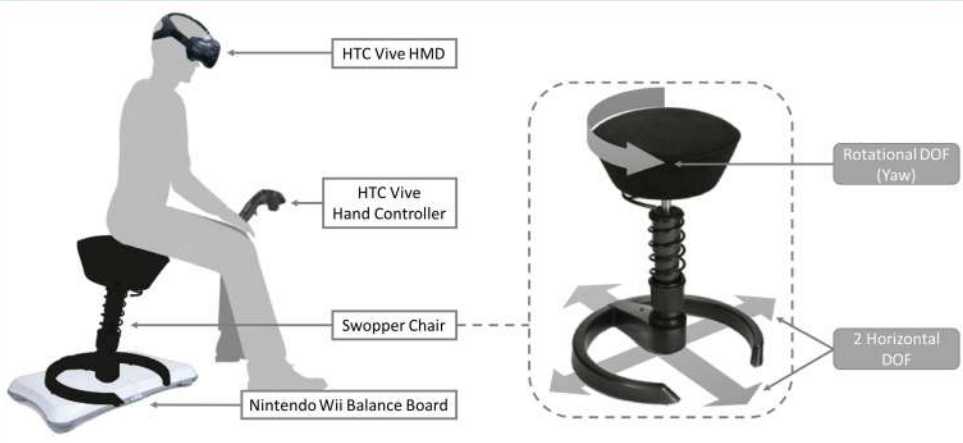
Navigation interface: NaviChair motion cueing stool (Swopper stool mounted on a Nintendo Wii balance board)



RESULTS

Task completion time: **Simulated Room** helped participants finish the task faster, compared to **Simulated CAVE** and the condition of **No Reference Frame**.

Travel distance: Participants significantly traveled a longer path in the condition of **No Reference Frame** compared to the condition of **Simulated Room**.



CONCLUSION

Whereas previous studies showed a clear benefit of reference frame in spatial updating tasks [1]–[3], the current study provides **first evidence that simply adding visually simulated reference frame consisting only of a wireframe rectangular box can provide significant benefits**.

Presented at IEEE Symposium on 3D User Interfaces

[1] R. L. Klatzky and B. Wu, "The embodied actor in multiple frames of reference," in Embodiment, ego-space and action, 2008, pp. 145–176.
[2] T. P. McNamara, "How Are the Locations of Objects in the Environment Represented in Memory?," Spatial Cognition III, vol. 2685, pp. 174–191, 2003.
[3] J. W. Kelly, M. N. Avraamides, and T. P. McNamara, "Reference Frames Influence Spatial Memory Development within and Across Sensory Modalities," in Spatial Cognition VII, 2010, pp. 222–233.