Tracking Multiple Collocated HTC Vive Setups in a Common Coordinate System

Tim Weissker, Philipp Tornow, Bernd Froehlich

Virtual Reality and Visualization Research Group, Bauhaus-Universität Weimar

**Bauhaus-Universität Weimar**

To the Extended Abstract

Motivation

- Inside-out tracking of HTC Vive leads to different tracking coordinate systems for collocated users (even when room calibration files are identical on each machine)
- Inconsistent user and controller representations in the virtual environment
- Impaired mutual awareness, understanding of pointing gestures, and co-presence

Our Solution

- Correction procedure that maps the tracking data of each individual HTC Vive instance to the coordinate system of a designated reference instance
- Requirement: one additional tracking target per user (e.g. Vive Tracker)

T_a T_b

Δ_{ab}
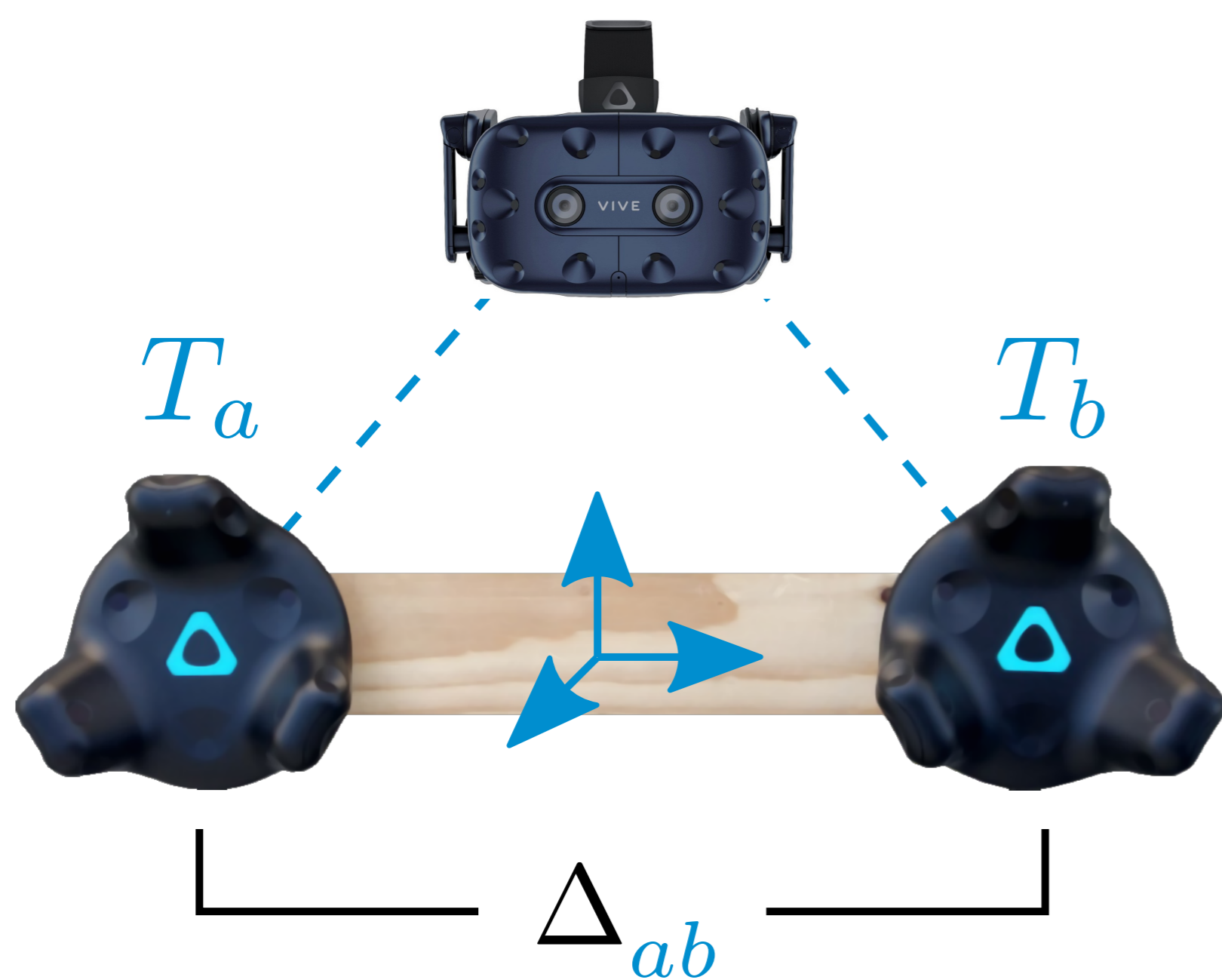
Ground-truth offset measurement before runtime

T_a T_b

Δ'_{ab}
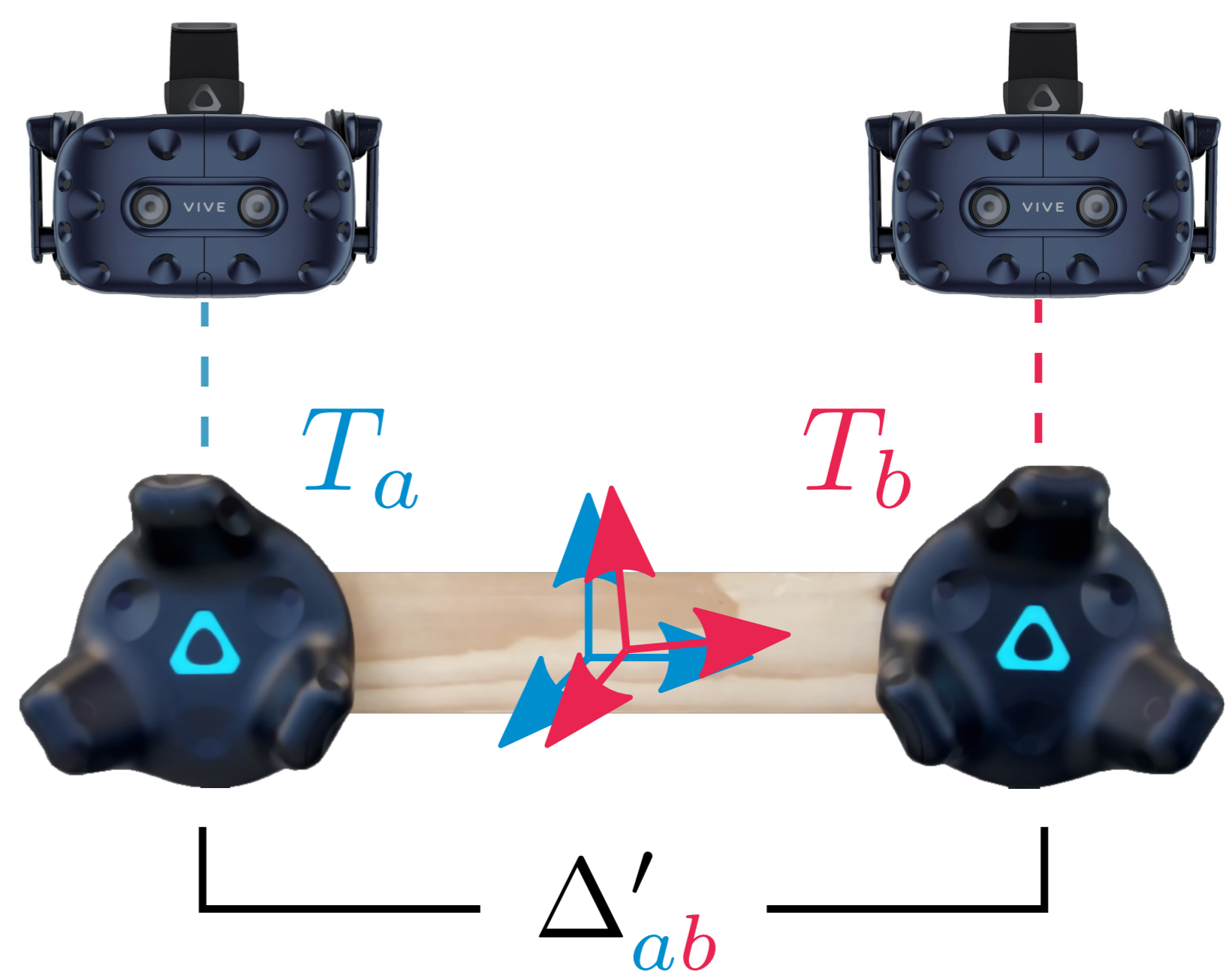
Deviations from ground-truth offset during runtime

Approach

- Attach additional targets to a rigid object to avoid changes in their relative transformation
- Pair targets with one of the systems to measure ground-truth offset matrix (6DOF) in the same coordinate system: $\Delta_{ab} = T_a^{-1} \cdot T_b$
- Re-pair the targets with their respective systems
- During runtime [1], compare offset as measured by the different systems to the offset obtained before
- Map all tracking matrices M of user b to the coordinate system of user a: $T_a \cdot \Delta_{ab} \cdot T_b^{-1} \cdot M$
- Result: considerable improvements in spatial consistency of collocated interactions (see right)
- Future work: align reference coordinate system with the physical ground plane [2]

0.05m

0.05m
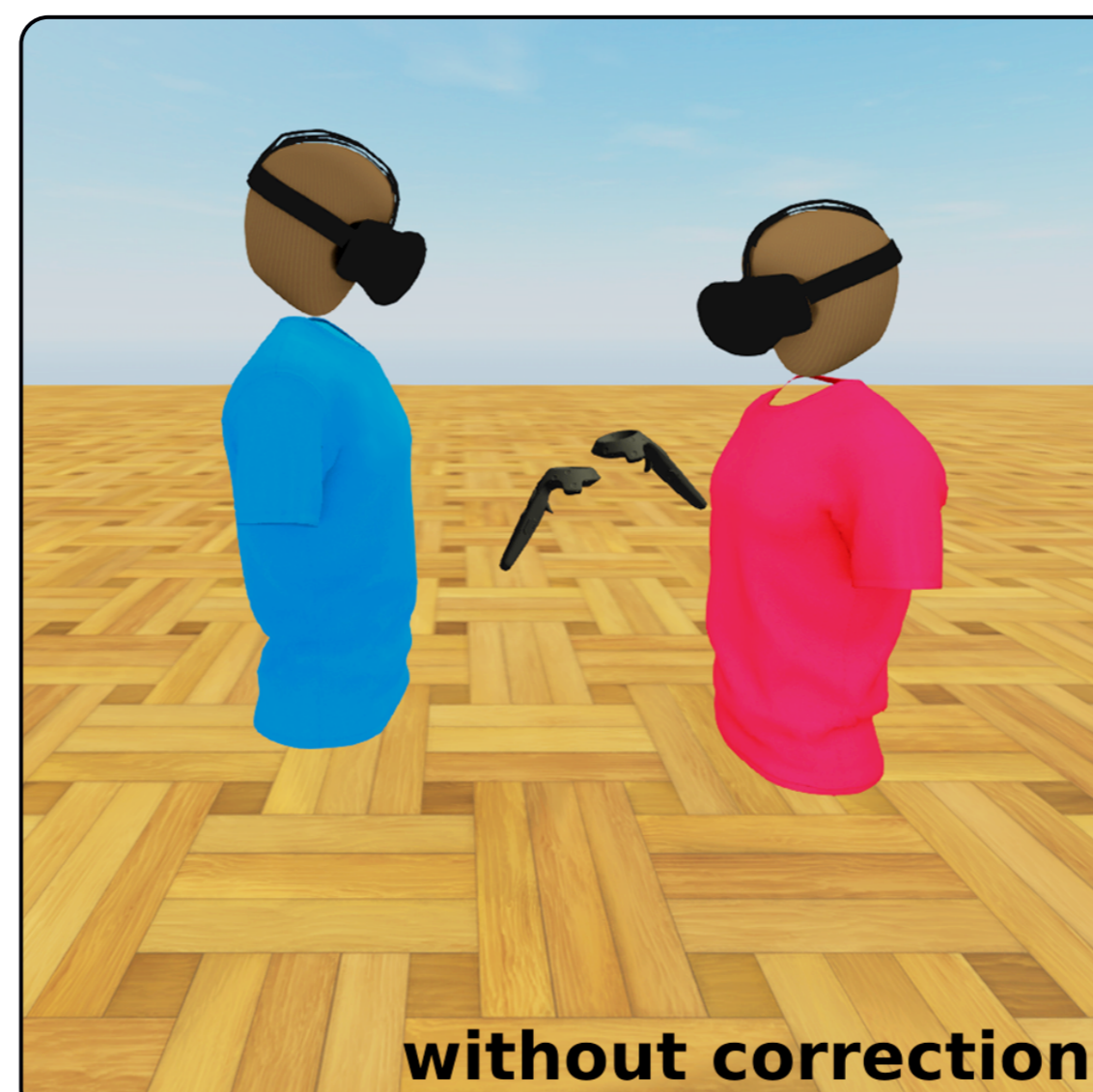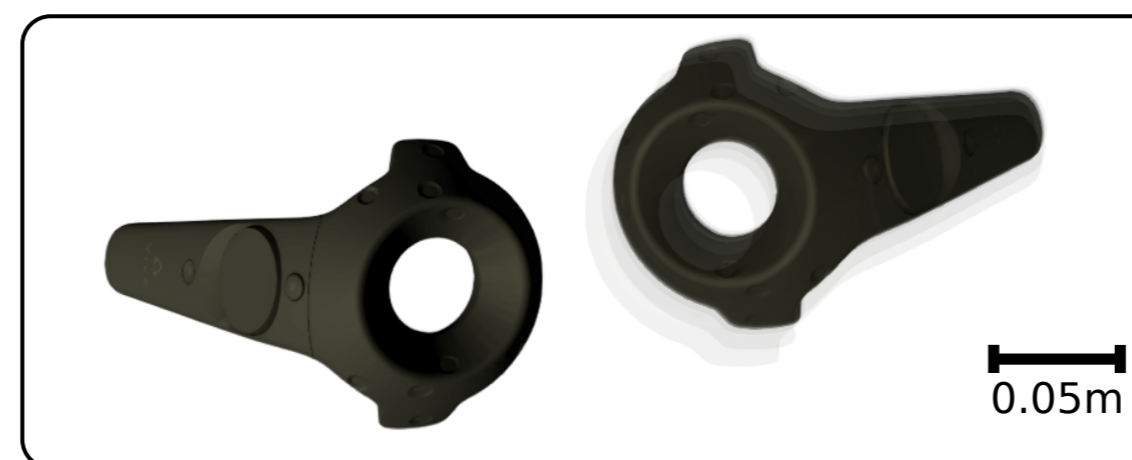
without correction
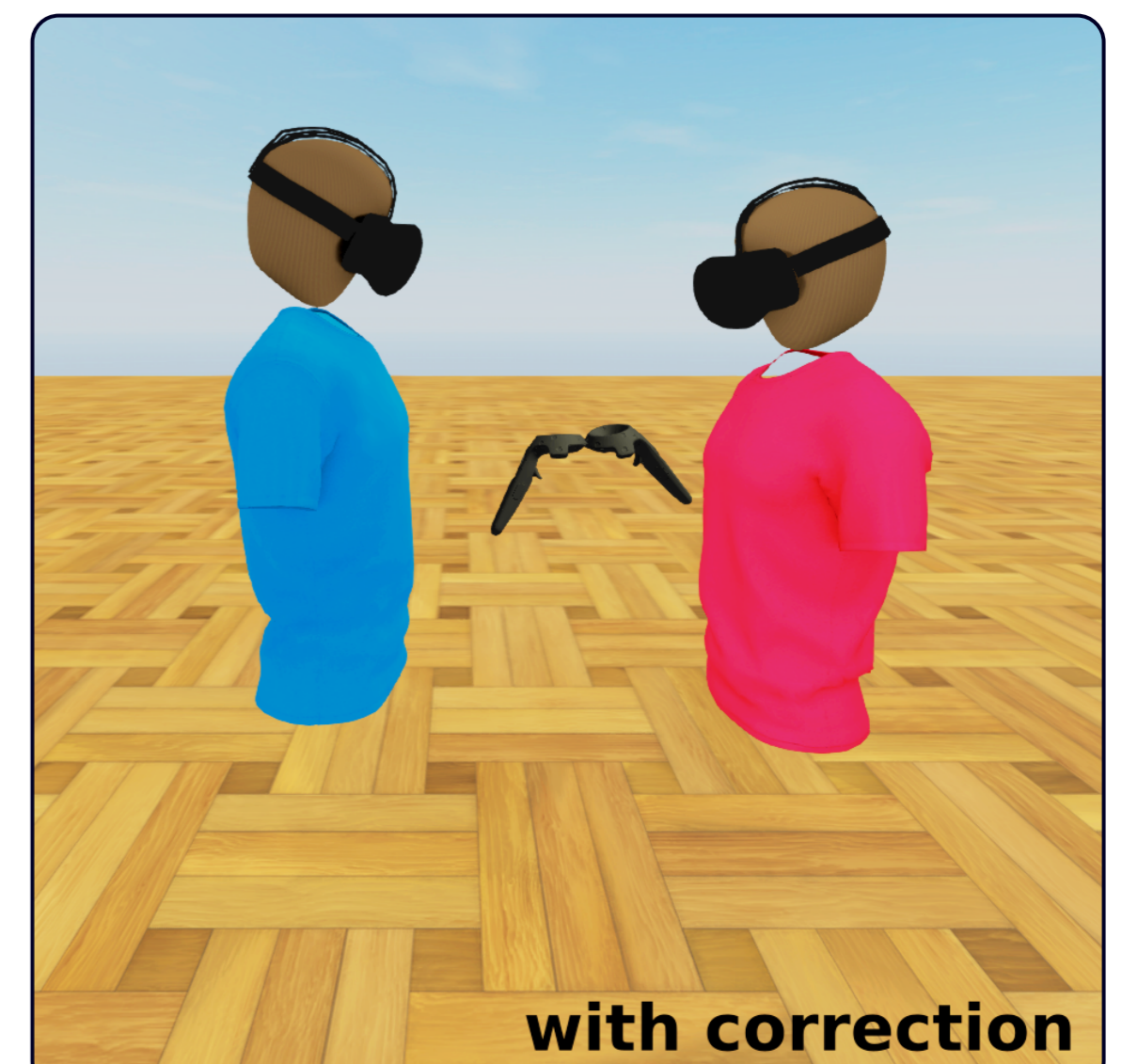
with correction

References

[1] D. C. Niehorster, L. Li, and M. Lappe. *The Accuracy and Precision of Position and Orientation Tracking in the HTC Vive Virtual Reality System for Scientific Research.* i-Perception, 8(3), 2017

[2] A. Peer, P. Ullrich, and K. Ponto. *Vive Tracking Alignment and Correction Made Easy.* In 2018 IEEE Conference on Virtual Reality and 3D User Interfaces (VR).

www.uni-weimar.de/vr

Contact: tim.weissker@uni-weimar.de