

VR creative

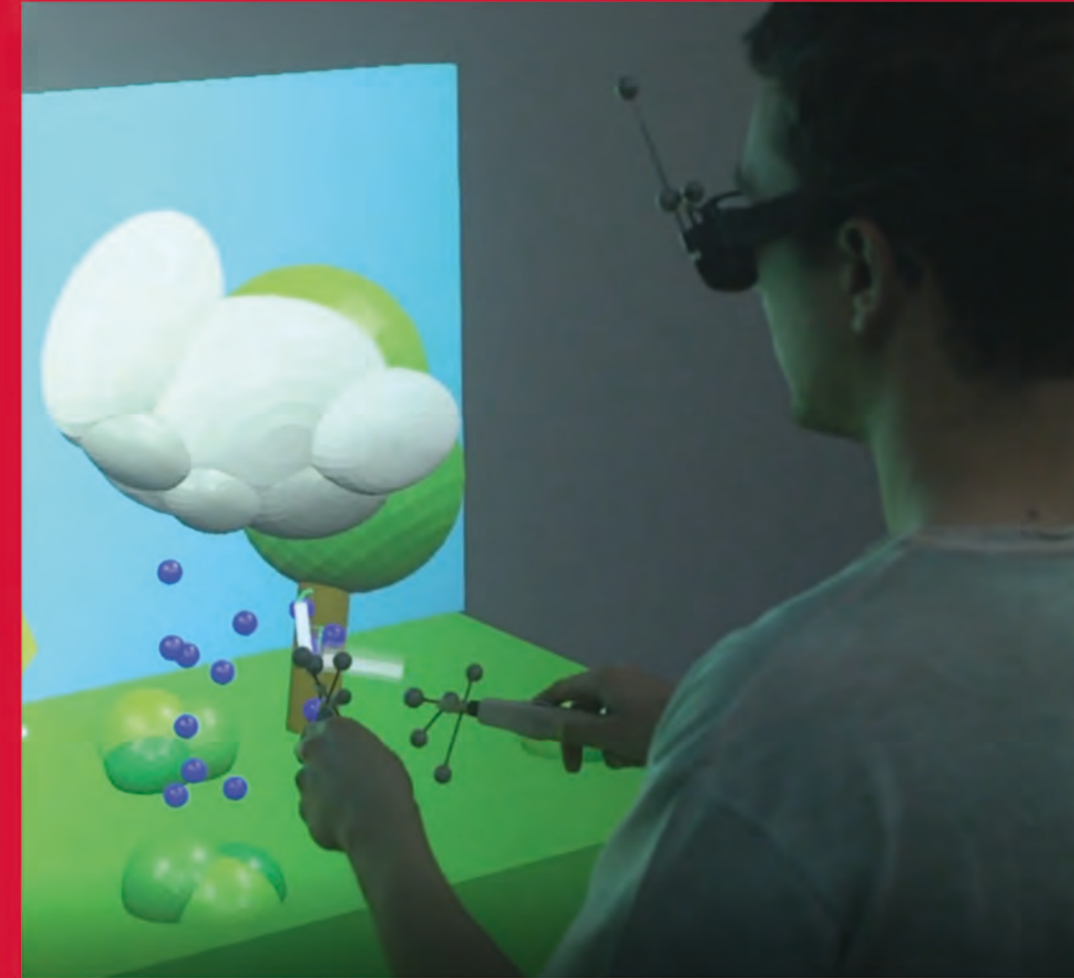
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Context: Student Project, Summer Semester 2021
Institution: Bauhaus-Universität Weimar, Media Faculty, Computer Science Department, Virtual Reality and Visualization Research Group

Virtual Reality Technology transforms the way people meet and work, by letting users immerse themselves in virtual worlds. The design of the 3D User Interface determines users' behaviour in the interactive virtual environment (IVE): Whether they are able to cooperate with others and are inspired to do so through the system's support for collaboration mechanics. [1]

PREVIOUS WORK

Developments for projection-wall VR systems in the research group resulted in a set of bimanual gesture-based interaction techniques for single-user 3D-modelling. [2]



PROJECT GOAL

The goal of the VR creative project was the adaption and extension of the previous set of interaction techniques according to three aspects:

- Use of the Oculus Quest 2 head mounted display (HMD)
- Networked implementation supporting remote multi-user settings
- Enabling cooperation between users for social and creative contexts



APPROACH

We considered the design spectrum that spans between professional VR 3D-modelling software and social VR platforms.

3D Modelling

Social Experience

We prioritized expressiveness over precision, using:

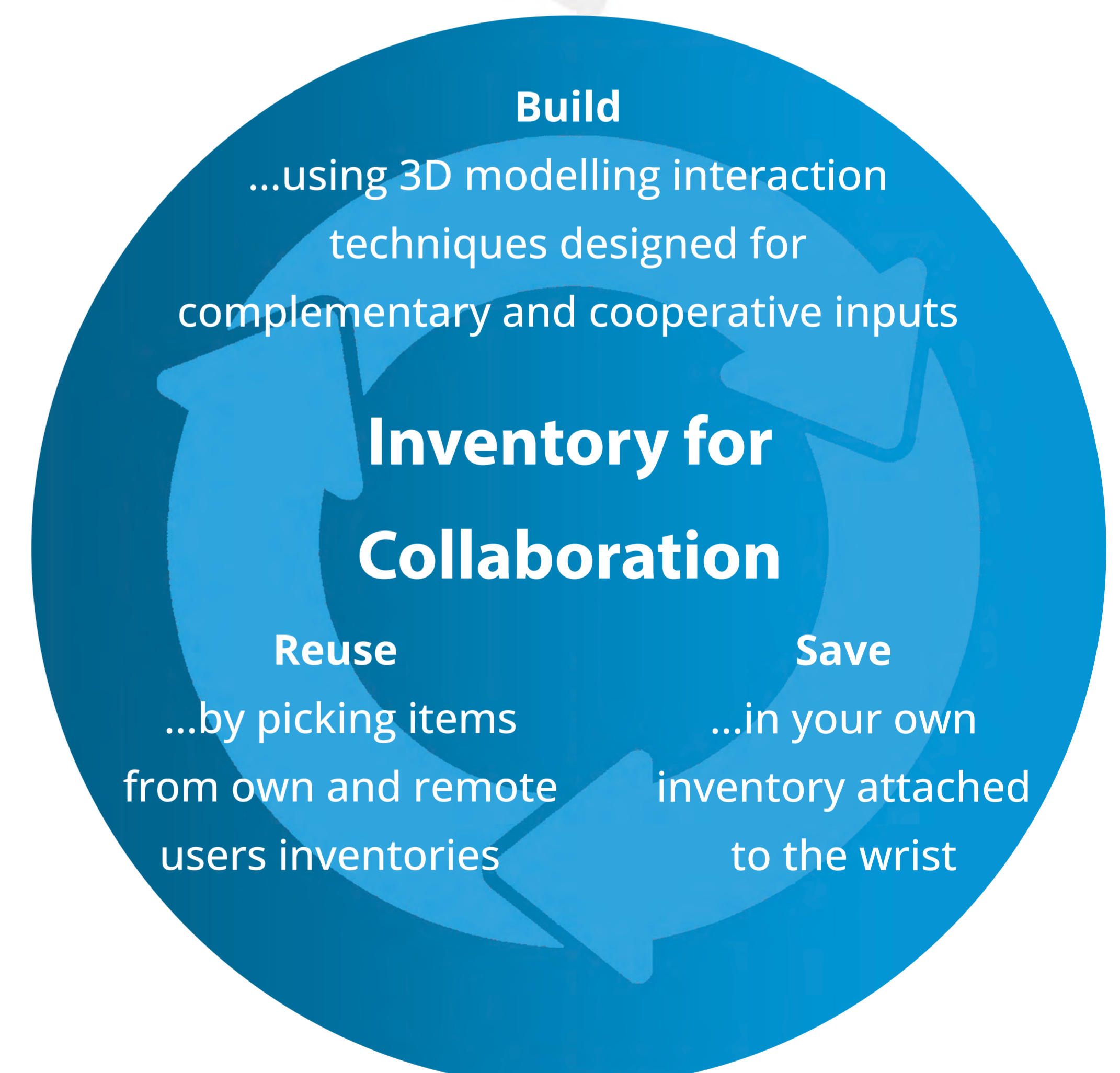
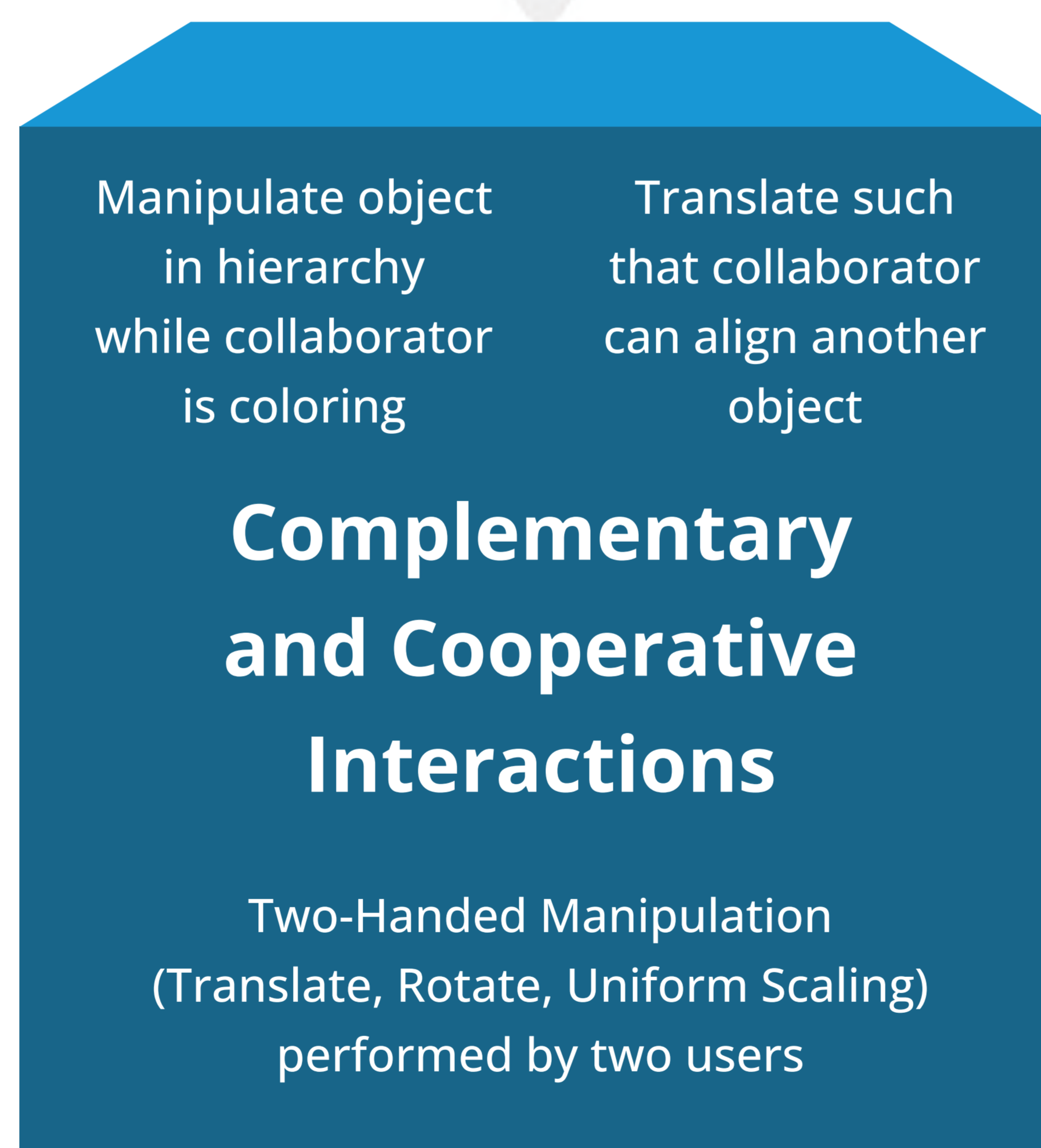
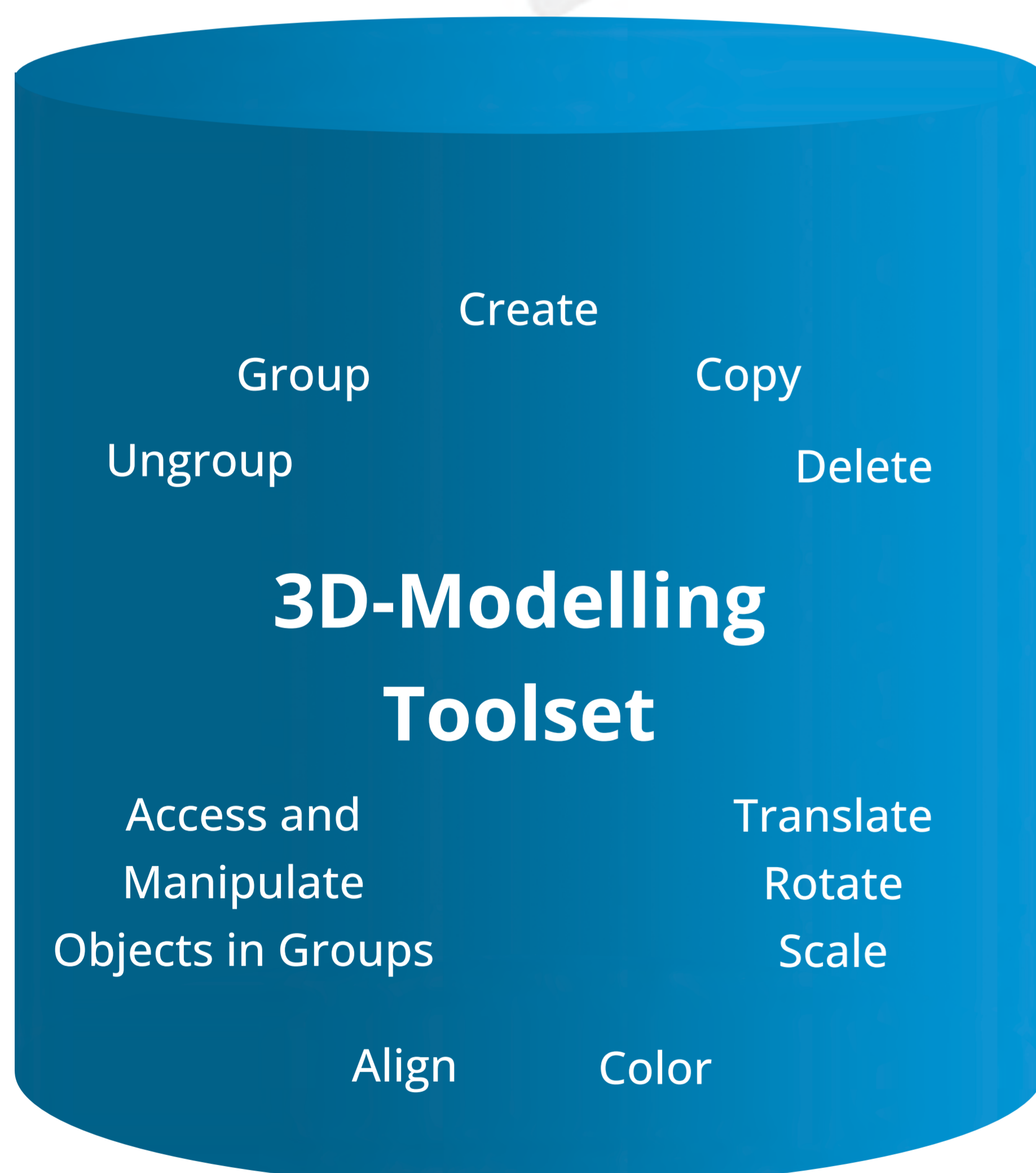
- Direct interactions with the virtual hand representation
- Manipulation of simple geometric shapes
 - Translation and rotation in 6 DOF
 - Uniform and non-uniform scaling through gestures based on bimanual interaction principles [2,3]
- Navigation in object hierarchies with hold-and-move approach [4]
- Gestures that can be learned by watching other users

The VR creative interaction toolset is designed to enable cooperative behaviour in social and creative contexts in Interactive Virtual Environments.

Using direct interactions based on gestures, users can rapidly compose virtual objects and scenes from just three basic shapes. (Cube, Sphere and Cylinder)

Multiple users can interact with the same object simultaneously. Either by users performing different interactions that complement each other or by cooperative interactions, where the interaction is performed together.

Our prototype for a shared inventory, which can be seen and interacted with by remote users, enables a cycle of cooperative and complementary interactions, and promotes workspace awareness.



APPLICATION

The toolset has already been used in a subsequent student research project. [5] In this, it allows users to create personalised avatars when attending a music performance in VR.



POTENTIAL FUTURE WORK

Extend the set of cooperative interactions:

- Navigate together in hierarchies of composite objects
- Jointly scale objects non-uniformly

Give users more control over the scaling and positioning of objects:

- Locking the object's position while scaling
- Allow scaling of users' avatars to make it easier to handle large objects (avoiding lever arm effect and object takes up less space in visual field)

See it in action!



Remember to vote for the best poster!



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References
[1] Gutwin, C., & Greenberg, S. (2000). The mechanics of collaboration: Developing low cost usability evaluation methods for shared workspaces. IEEE WET ICE 2000
[2] Hartmann, M. (Winter Term 2019/2020) Implizite Moduswechsel für zweihändige 3D Modellierungsgesten. Bachelor Thesis.
[3] Guiard, Y. (1987) Asymmetric division of labor in human skilled bimanual action: The kinematic chain as a model. Journal of Motor Behavior, vol. 19, no. 4, pp. 486-517
[4] Kulik, A., Dittrich, J., Fröhlich, B. (2012) The Hold-and-Move Gesture for Multi-touch Interfaces. MobileHCI '12, pp. 49-58
[5] Music Performances in Virtual Reality (2021) www.uni-weimar.de/de/medien/professuren/medieninformatik/vr/teaching/ws-202122/project-music-performances-in-vr/