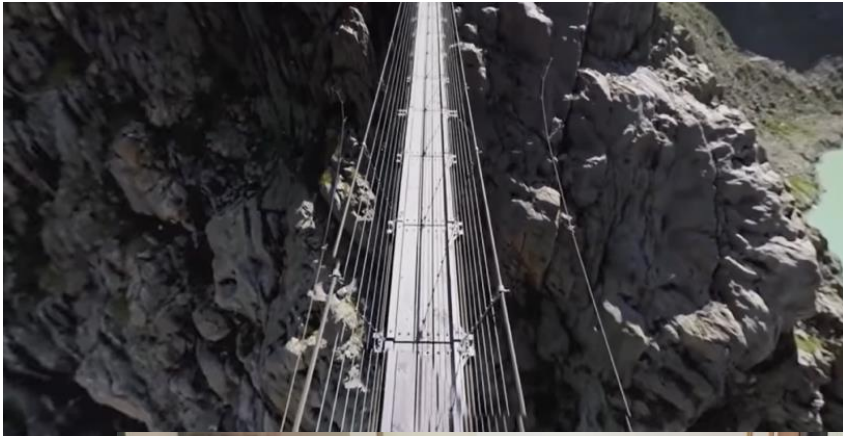# Simulating Reality
The Importance of Realism in VR
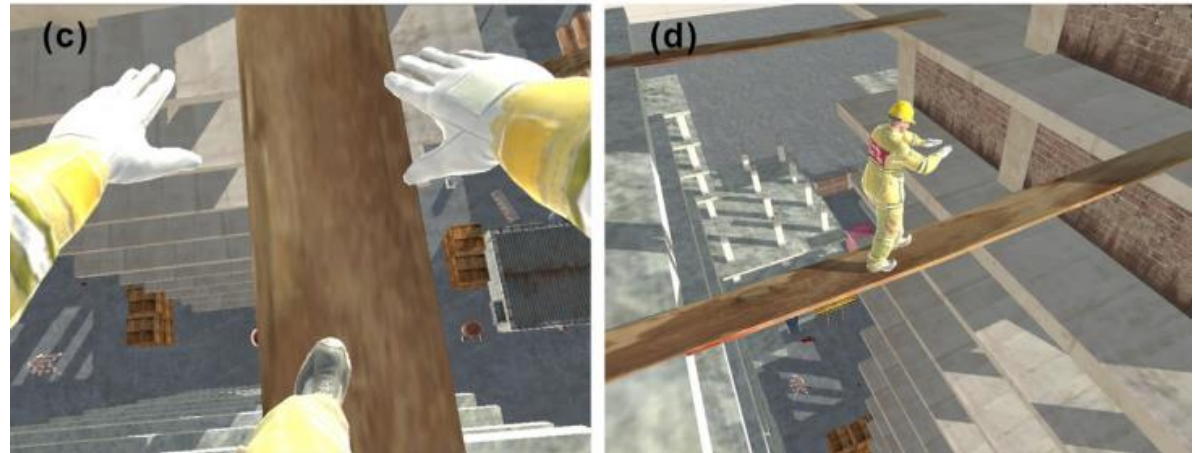
Katja Zibrek, ISFP Researcher, Inria Rennes

7.12.2023, Polytech Nancy

VR for Rehabilitation and Training Simulations

Construction workers training

Fear of heights treatment

Diversity and inclusion training
(Virtual Bodyworks: https://www.virtualbodyworks)

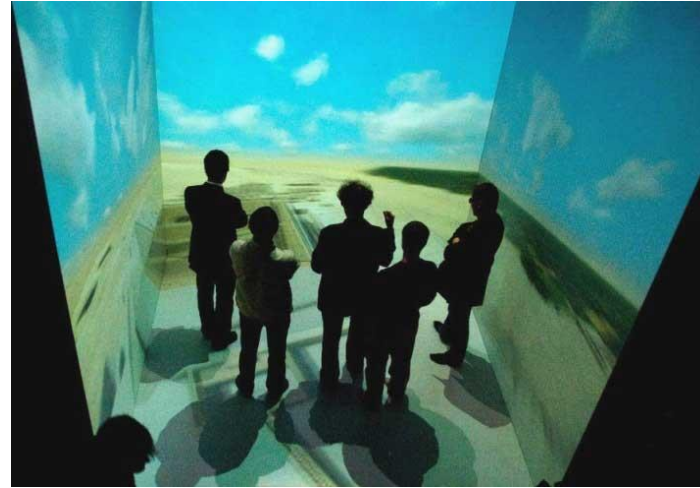# Perceiving Reality

Vision

Sound

Smell and taste

Proprioception

Touch

Simulating Reality: VR

🎵 👁 ✋ Immersion
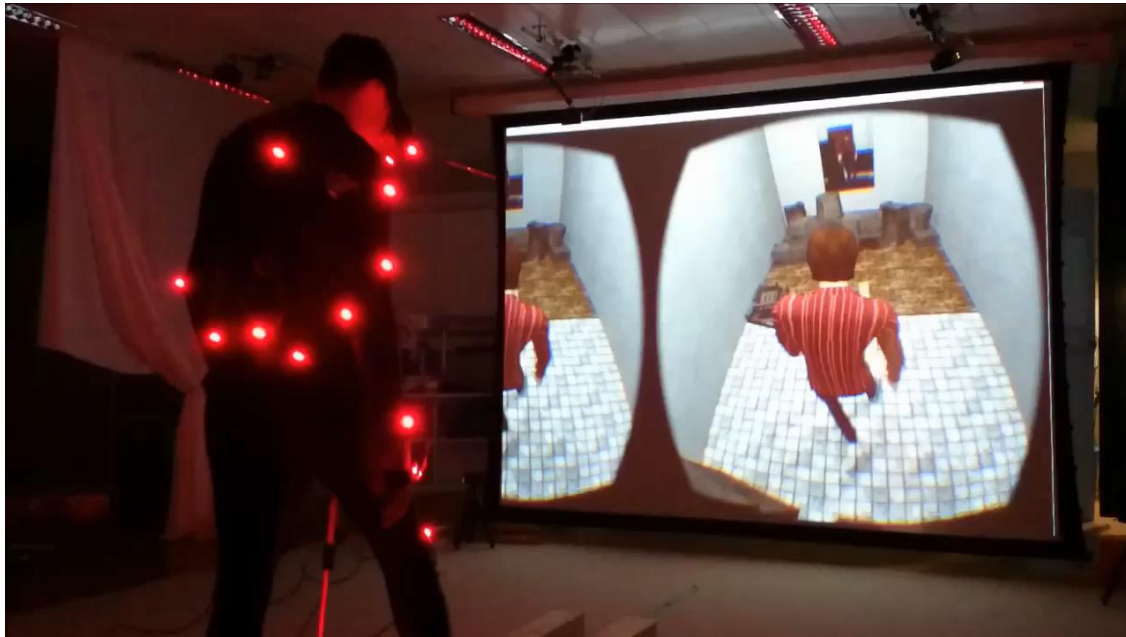
VR ≠ AR,MR

VR = Complete disconnect from reality

The events in VR *feel* real even though we understand they are not:

PRESENCE

Presence

Meehan et al. (2002): Physiological measures of presence in stressful virtual environments
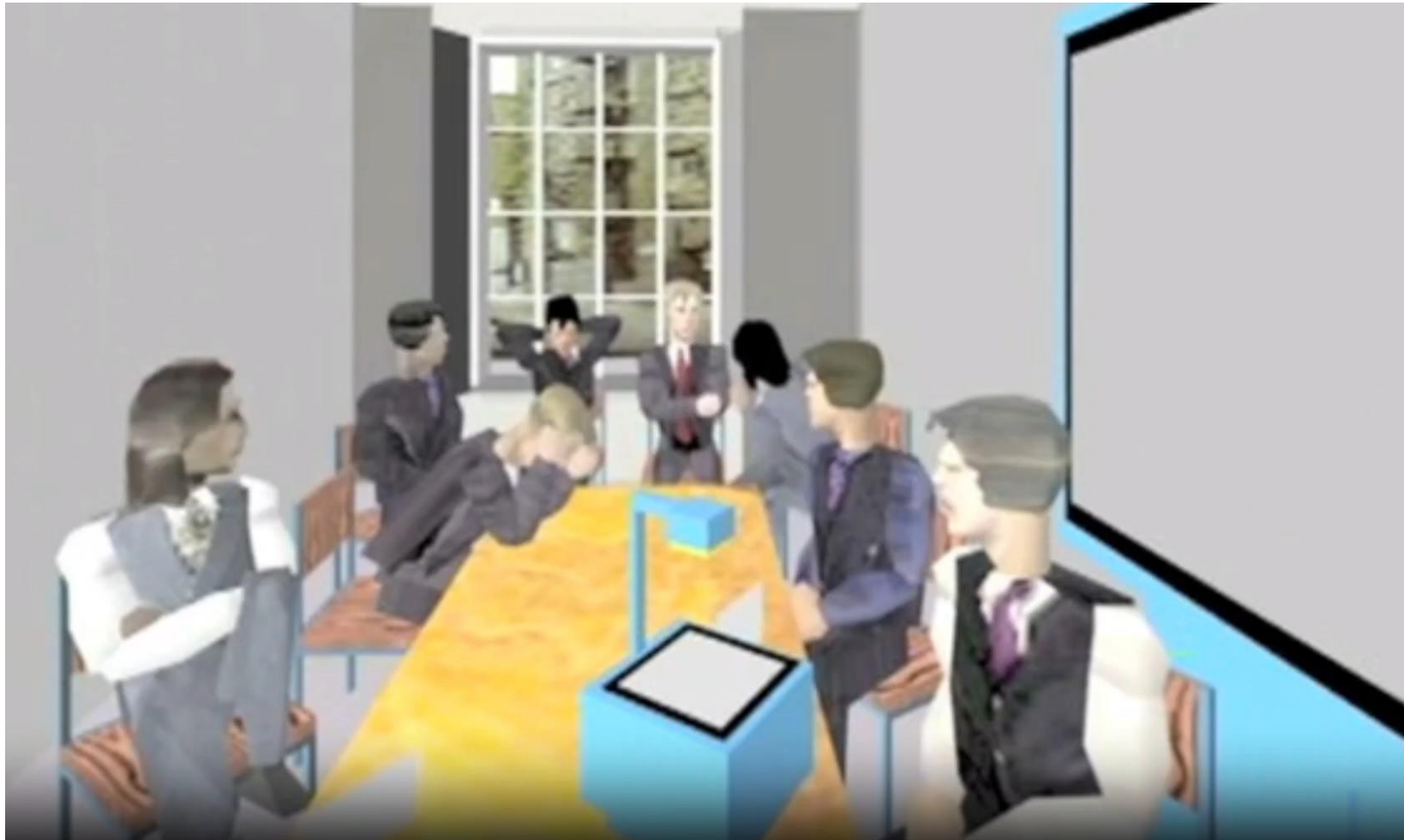

Source: Henrique Debarba (Immersive Interaction group)

Virtual pit experiment, Source: University of North Carolina at Chapel Hill, USA

Social Presence

Pertaub et al. (2002): An experiment on public speaking anxiety in response to three different types of virtual audience. *Presence, 11*(1), 68-78.

Self-perception: Embodiment

-I see myself in a mirror and it seems as if I have the body of a woman

Seinfeld et al. (2018): Offenders become the victim in virtual reality: impact of changing perspective in domestic violence.
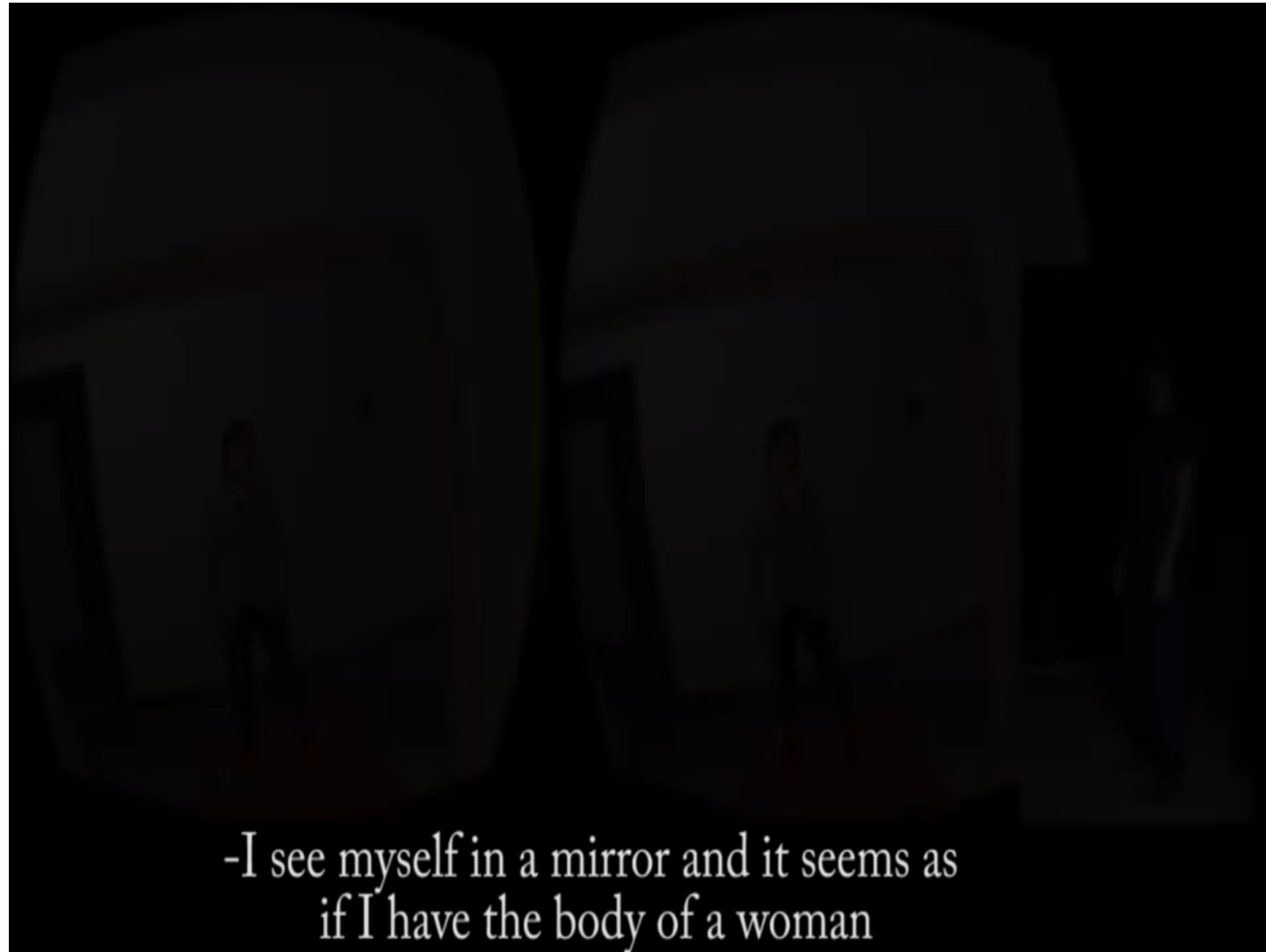
Determinants of presence

Presence is related (but not equal to) immersion: **Immersion** - fidelity and extent of sensory information **Presence** – relevant information
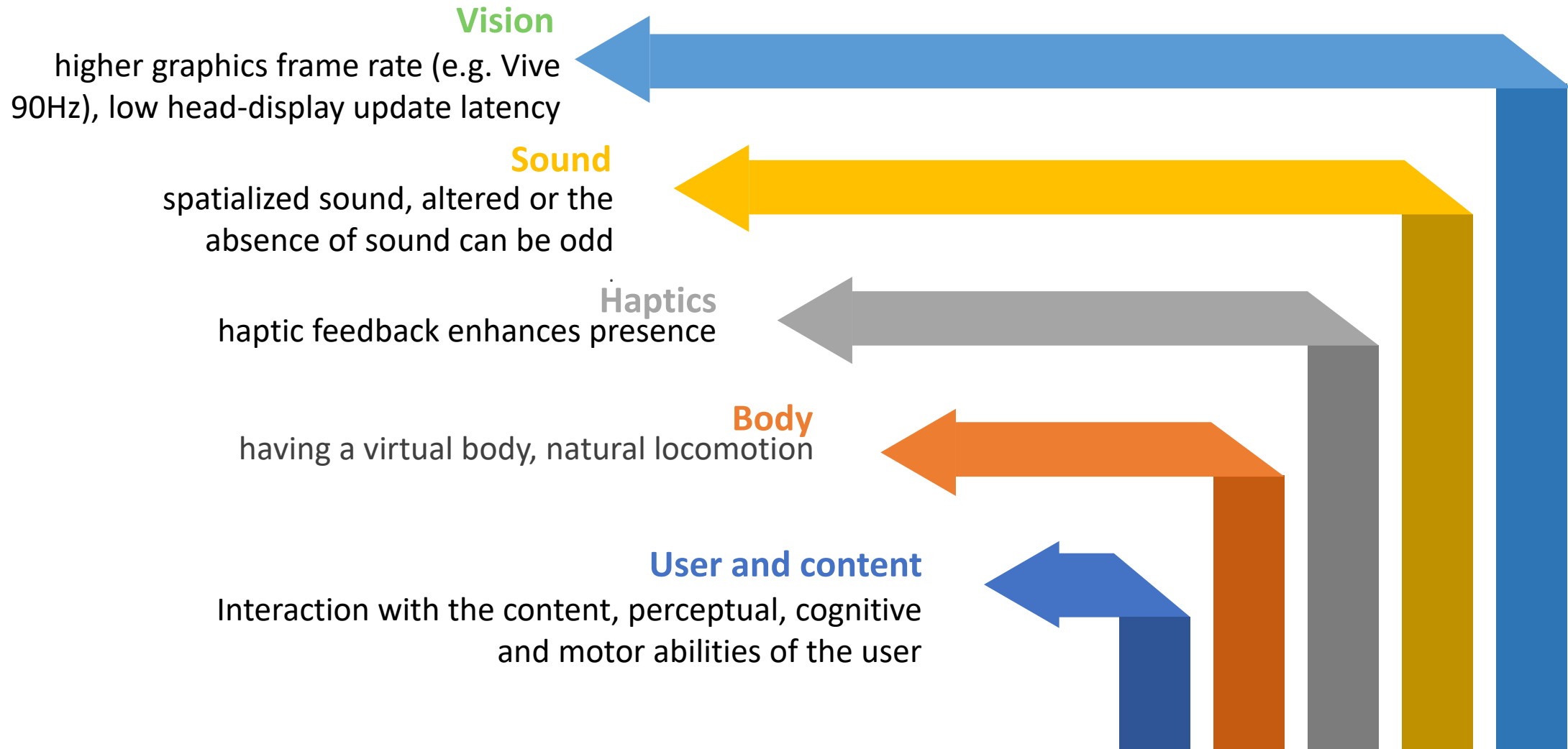
Vision

higher graphics frame rate (e.g. Vive 90Hz), low head-display update latency

Sound

spatialized sound, altered or the absence of sound can be odd

Haptics

haptic feedback enhances presence

Body

having a virtual body, natural locomotion

User and content

Interaction with the content, perceptual, cognitive and motor abilities of the user

Importance of Photorealism

Early research: not realistic but could induce presence; more realistic, higher expectation (Slater and Steed, 2000, Pertaub et al. 2002, Slater 2009)

+

- Realistic VR environments evoked more positive affective and serenity responses, as well as a greater sense of presence (Newman et al. 2022)

- Medical training: detailed content especially helpful for difficult, complex, or unfamiliar depth-related tasks (McIntire et al. 2014)

- Stress tasks: stress becomes stronger with higher level of realism, small difference between realistic and real environments (Weiss et al. 2021)

0/-

- Realism as higher polygon count: not crucial for presence (Volkmann et al. 2020)

- Differences in realism during an assembly task do not influence performance as or heart rate (Taylor et al. 2018)

- Stress tasks: realism of avatars increased presence but did not influence stress response (Kwon et al. 2013)

The intensity of stress tasks was not the same!
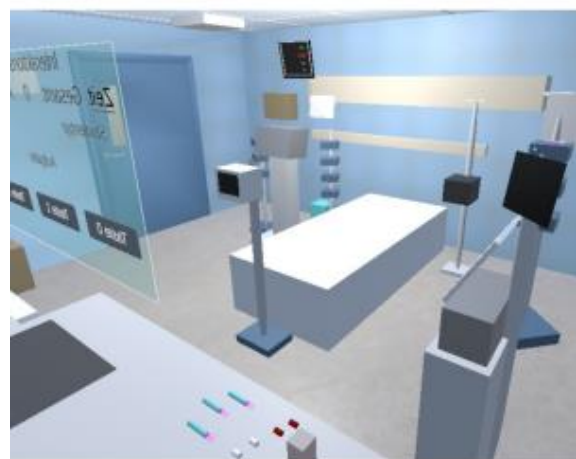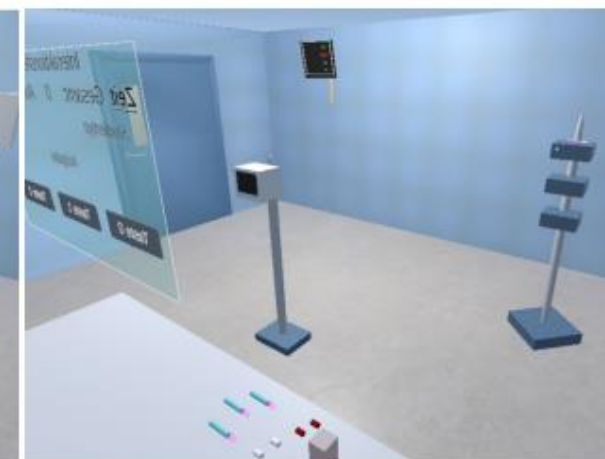
Rose et al. 2018

Real · Realistic · Abstract 1 · Abstract 2

Weiss et al. 2021

Virtual Humans and Realism

- **Preference for realism in VR:** higher affinity and presence in the realistic render style (Zibrek 2018, 2019)

- **Point cloud reconstruction-based avatar superior** to the virtual character avatar regarding perceived co-presence, social presence, behavioural impression, and humanness (Yu et al. 2021)

- **Interaction** is important - the artificial agent should notice and respond appropriately to the user (eye-gaze behaviour)

- **User** characteristics play an important part (social anxiety, gender, VR experience)
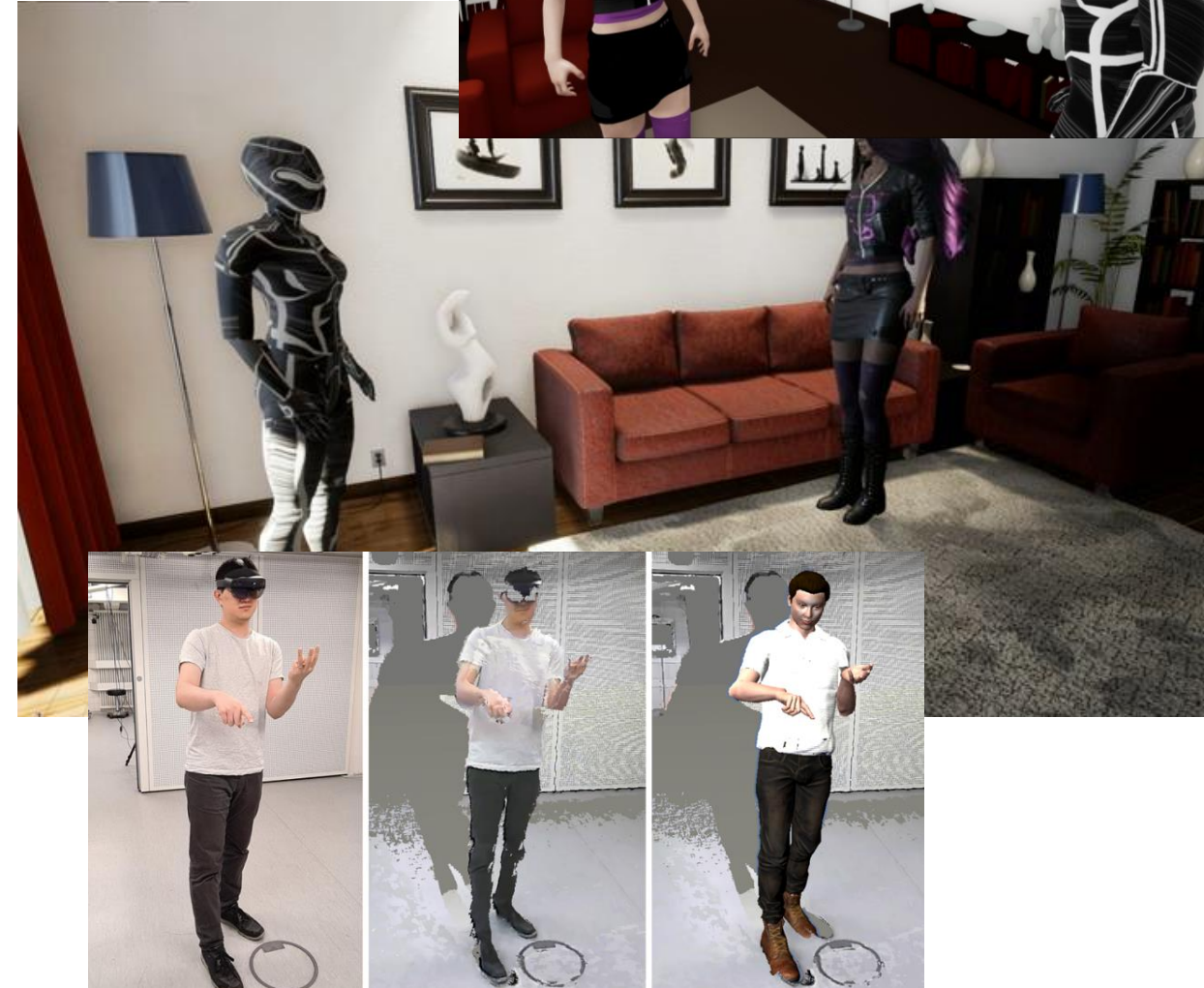
Conclusion

- Virtual reality is a beneficial tool for simulating scenarios which are difficult to reproduce in physical reality

- Higher presence - > more realistic emotional response

- Higher visual realism = higher presence (more realistic emotional response)
  - task and scenario dependent
  - virtual humans behaviour more important
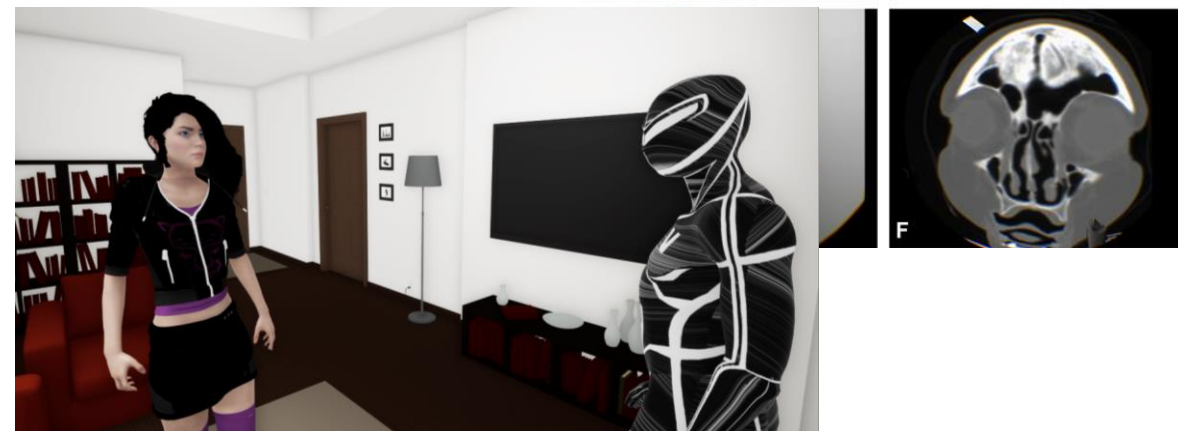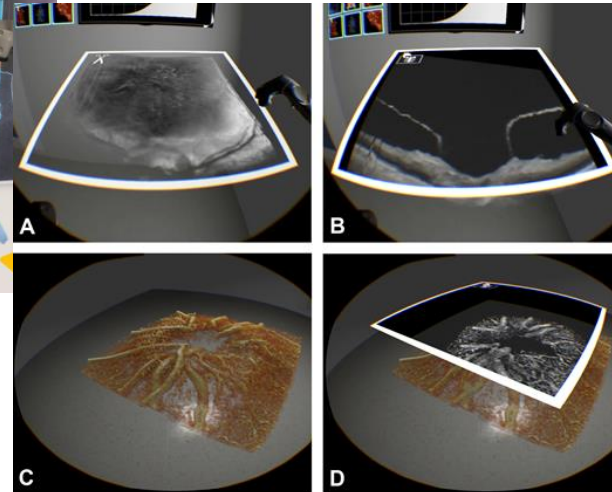
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Merci!

VirtUs team, Inria Rennes

We are on X: @virt_us

and LinkedIn!