Foundational Immersion Concepts

Developing Immersive Applications

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Learning Objectives:

- explain Milgram and Kishino's Reality-Virtuality Continuum
- appreciate the different interpretations of immersion

Recap

- thinking about the differences between AR, VR, and MR experiences

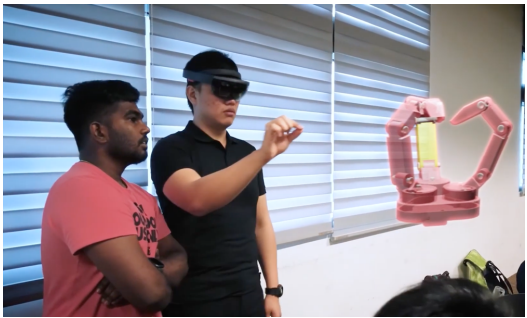
VR vs AR vs MR

Watch:

`https://youtu.be/d3wx3VGtFjo`

Prompt:

What type of experience is this?



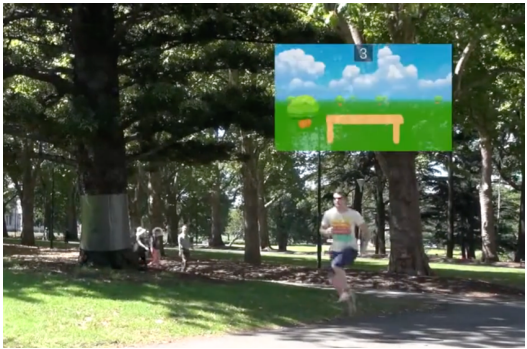
VR vs AR vs MR

Watch:

`https://youtu.be/oY_94nGMIXY`

Prompt:

What type of experience is this?



VR vs AR vs MR

Watch:

`https://youtu.be/DAOKFVCFrJ4`

Prompt:

What type of experience is this?

Milgram-Kishino RV Continuum

- not the immersification continuum
- originally meant for display technologies

Source: https://doi.org/10.1117/12.197321

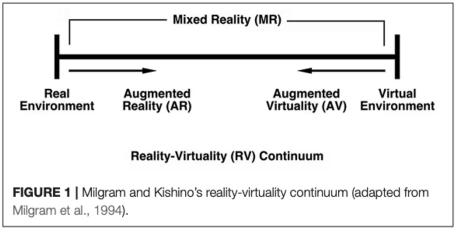
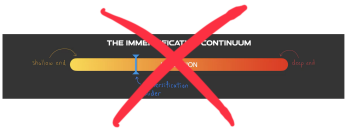


FIGURE 1 | Milgram and Kishino's reality-virtuality continuum (adapted from Milgram et al., 1994).



Dimensions of the RV Continuum

- EWK: how much the system understands the real world
- RF: how realistic the assets are
- EPM: how interaction affords realism

Source: https://doi.org/10.1117/12.197321

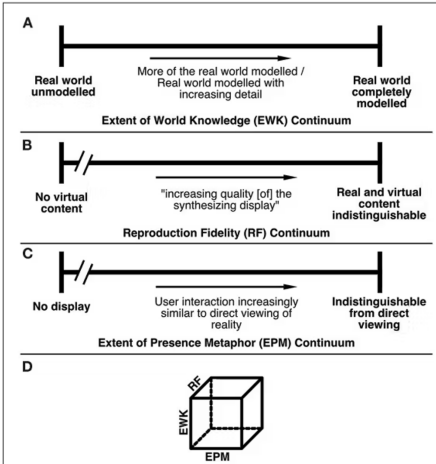


FIGURE 3 | The EWK **(A)**, RF **(B)**, and EPM **(C)** continuua, as well as the proposed framework combining the three **(D)** (adapted from Milgram and Kishino, 1994; Milgram et al., 1994).

Revisiting the RV Continuum

- combined RF and EPM into IM
- added CO to represent the user
- common perception of MR is different

Source: https://doi.org/10.3389/frvir.2021.647997

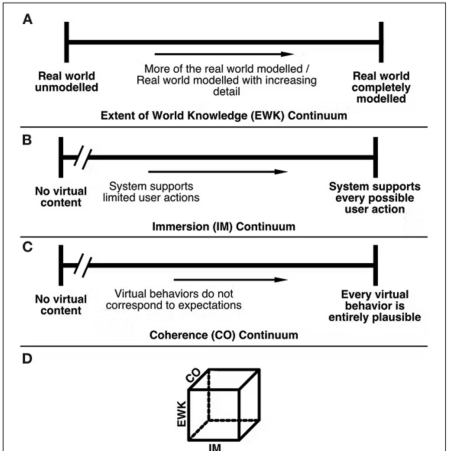


FIGURE 5 | Our three dimensional taxonomy consisting of EWK **(A)**, IM **(B)**, and CO **(C)** dimensions, as well as the relationship among the three **(D)**.

Summary

Today we covered:

- RV continuum foundations and dimensions
- classifying experiences along the continuum
- updated RV continuum perspectives

Next: Immersion as system properties and user experiences

Further Reading

Key Research Papers:

- Revisiting RV Continuum (2021)
- Place illusion and plausibility (Slater, 2009)
- Understanding User Experiences Across VR Walking-in-place Locomotion Methods
- Combining think-aloud and physiological data (CHI paper)

User Study Research:

- Video presentation of VR locomotion user study
- Prezi: Cybersickness measurements user study
- The Conversation article on flow
- Kitaro's Matsuri video (flow example)

Further Reading (cont.)

Questionnaire Instruments:

- Flow scales from Mind Garden
- Igroup Presence Questionnaire (IPQ)
- Simulator Sickness Questionnaire (SSQ)
- Motion Sickness Questionnaire
- Psychometric evaluation of SSQ as measure of cybersickness
- Virtual Reality Sickness Questionnaire (VRSQ)

Further Reading (cont.)

Cybersickness Research:

- Factors Associated With VR Sickness in HMDs (Systematic Review)
- Don’t make me sick: investigating cybersickness in commercial VR
- Narrative and gaming experience interact to affect presence and cybersickness
- Presence and Cybersickness in VR Are Negatively Related (Review)

Best Practices and Resources:

- Meta’s Best Practices to avoid cybersickness
- Design of Everyday Things (book)