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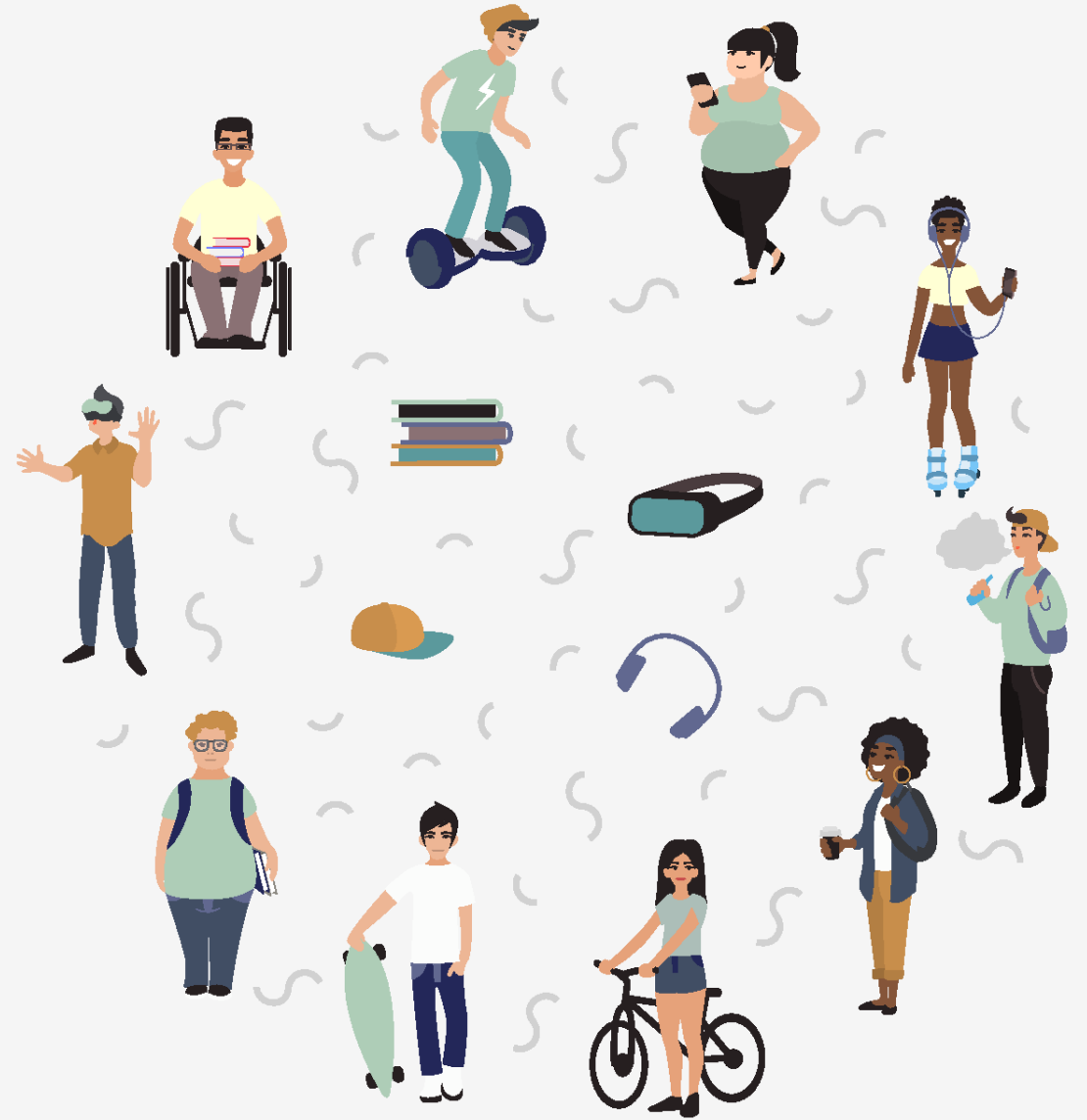
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XR Accessibility: Can we do that?

All opinions are my own.

Agenda

- About Deb
- TL;DR
- Main Topics:
 - Accessibility of Augmented and Virtual Reality
 - Creating accessible experiences now
 - Creating accessible experiences in the future
- Q&A



About Deb

- XR Software Engineer and Accessibility Technologist
- 6 years XR Experience
 - Currently focused on enterprise adoption of XR and use of in museums/education
- 3 years Accessibility Experience
- Master's in Ancient Cultures and Information Technology
- www.debmayers.com



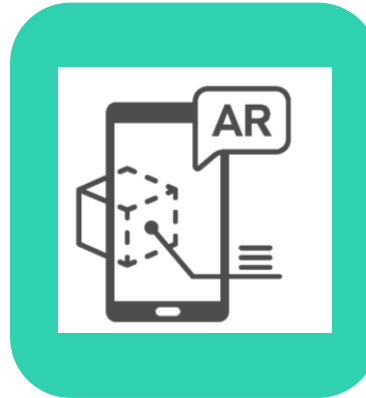


TL;DR

We can add some bits of accessibility into XR experiences, but current technology has inherent limitations. Specifically, the weight of the headset and addition of input/output devices (i.e. assistive technologies)

Before Creating an XR Application

- Do you want AR, VR, MR, or a Mix?
- Interactive? 360 Video? Model Viewer?
- Web Based
 - 8th Wall
 - Aframe
 - AR.js
 - React XR
- Native App
 - Unreal
 - Unity
 - ARCore
 - ARKit



- Apple
- Android
- Web Based
- HoloLens
- Magic Leap
- Meta



- Oculus
- Vive
- Varjo
- Web Based
- Windows Mixed Reality

Accessibility of XR



XR Accessibility: Example Users



Audio:

- People who are Deaf
- People who are hard of hearing
- In an arcade
- In a museum
- In a quiet place without headphones

Cognitive

- People with cognitive disabilities (Anxiety, Depression, Dyslexia, Autism, ADHD, etc)
- Someone who is distracted
- Using XR for pain therapy

Mobility:

- People with mobility disabilities
- People who get motion sickness
- People with kids/pets at home
- Small living spaces

Visual

- People who are blind
- People with low vision
- Using AR in a sunny area
- Eye strain from playing in VR or MR headset

What we need to do



Inclusion:

- Critical Step
- Design with not for
- Involve at every stage in the development process



Senses

- Visual
- Aural
- Haptics
- Scent
- Taste
- Vestibular
- Proprioception



Guidelines:

- [XRA Developer Guidance](#)
- [XRAccess Resources](#)
- W3 Groups
- [Oculus Virtual Reality Check](#)
- [PEAT Inclusive Hybrid Work](#)
- [Equal Entry](#)



Communities

- [XRAccess](#)
- [XRSI](#)
- [A11YVR](#)
- W3 [Immersive Captioning, Inclusive Design for Immersive Web](#)



Creating Accessible XR Experiences Now

Research and Experimentation

- Strides are being made
 - Vacation Simulator
 - Beat Saber
- How can we...?
 - 3D Content Descriptions
 - Captioning
 - Alternate ways of moving
 - Use XR as assistive technology



Visual Guidelines

- Display text on a background, and at a suitable distance (no closer than 0.5 meters away)
- Descriptions on room, 3D objects in the room
 - User needs to know *where* they are *what* is in front of them
- Color Contrast (4.5:1)
- Text Size and Typography
- Limit flashing/blinking content, turn off background noises and content
- Interactable objects are large enough and non-visual way to know about interaction
 - Allow user to change verbosity and time delay
- Audio Descriptions
 - Normal, verbose, quick, time delay of when to speak, someone guiding in the experience



Audio Guidelines

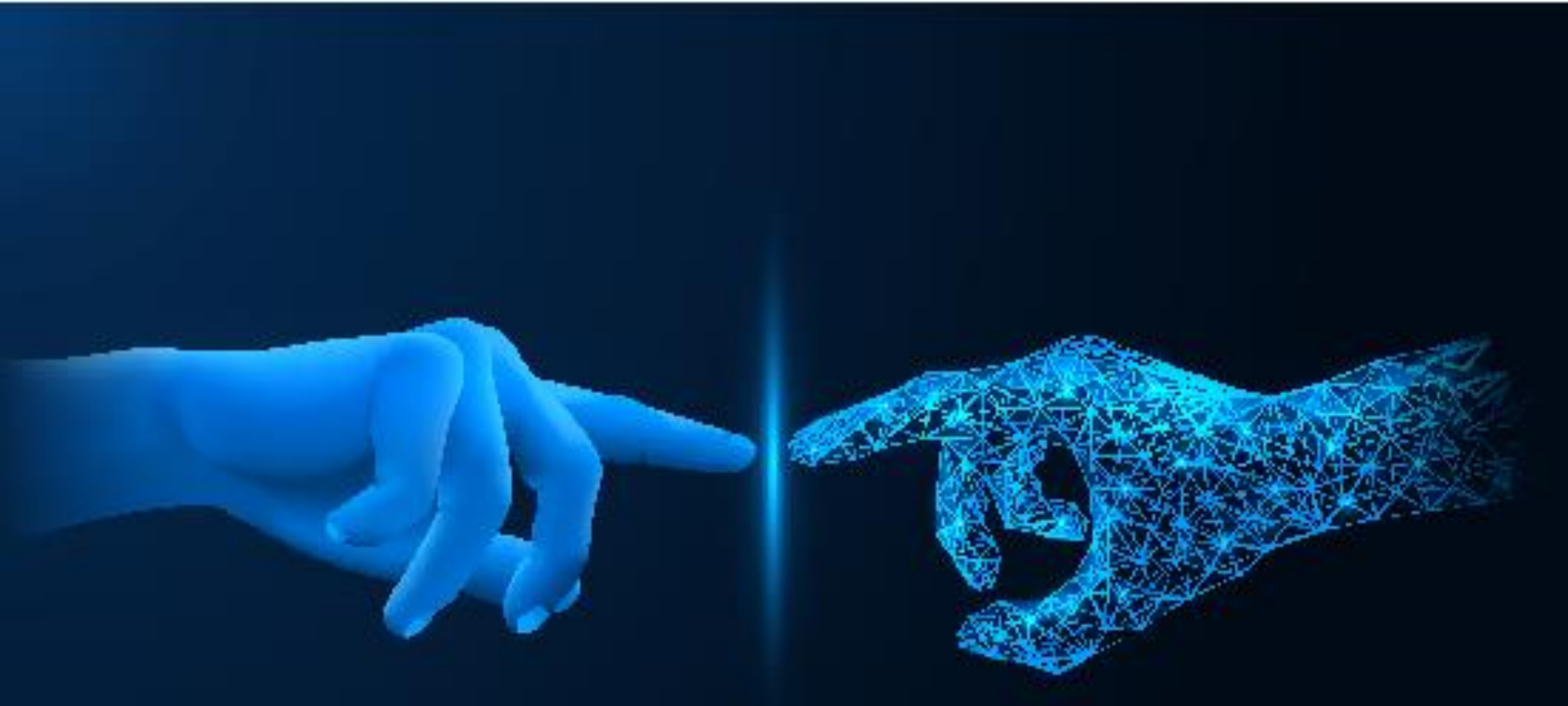
- Important sounds are displayed with text and/or haptics
 - User should be able to control *how* they want to perceive audio
- Captions are displayed appropriately
 - User should be able to move captions
 - User should be able to customize captions, i.e. font size, color, how many lines, verbosity, location
- Sign language (hand tracking)
- Transcripts are available for users (Can you use haptics for braille??)
- Mono Audio and Spatial Audio
- Changing the volume of background noise and speaking



Mobility Guidelines

- Accurate scale of user
 - Reset camera height/arm length
- Seated, Standing, or Room Scale
- Move camera position with controllers
- Multiple Inputs
 - Keyboard, controllers, hands, eyes, voice, switch devices, BCI
- Allow a good target size
- One handed mode
 - Handedness





Creating Accessible XR Experiences
in the Imagined Future

Future Work

- Easier to go cross platform
- Accessibility built in
- Accessible Hardware
- Assistive Technology built on device, or able to add to the device easily
- Automatic User Customizations
 - Room Scale, Standing, Siting, Locomotion
 - Allow user to change the experience to suit their needs
- Strong Guidelines for Design, Development, and Testing
- OpenXR type API
 - We don't want an ARIA patch
- Accessible Object Model





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Thank You!

Any Questions?

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