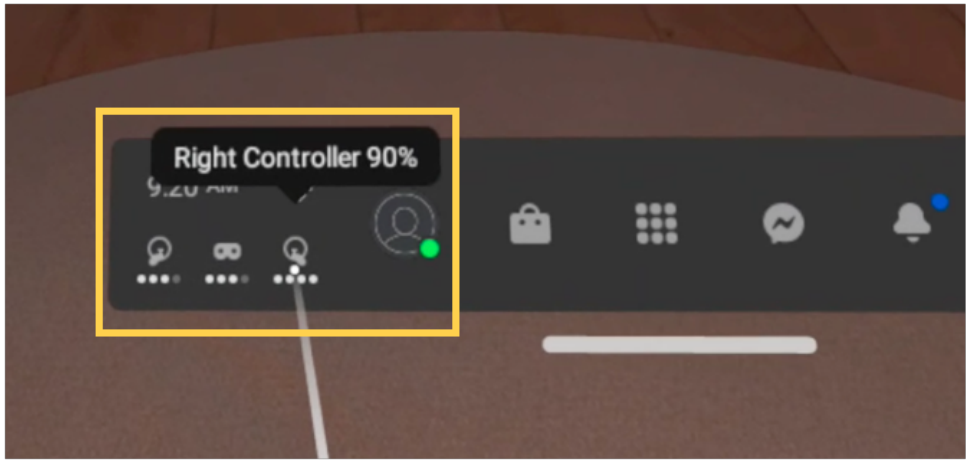
VR and Accessibility

CSCI 497T/597T

Usability of VR

- Visibility of System Status



The universal menu in Oculus Quest communicated battery status for the headset and two controllers.

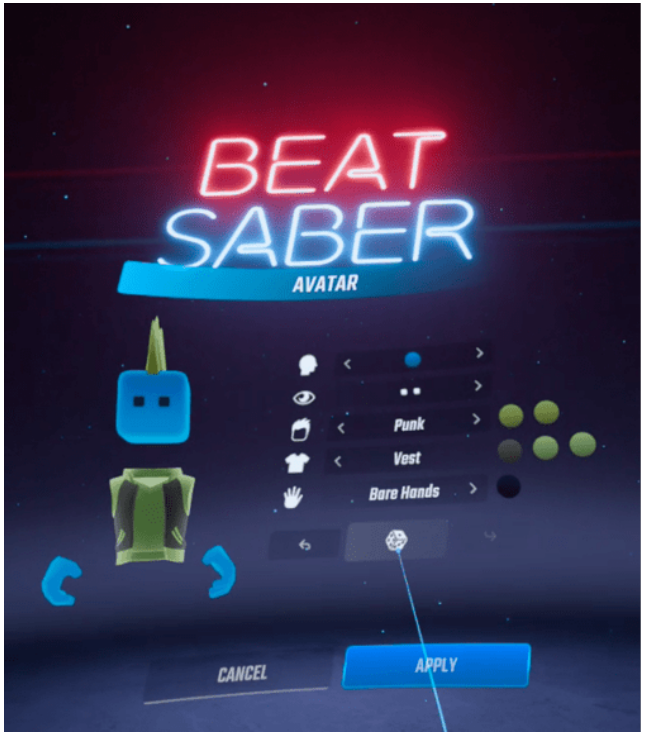
Usability of VR

- Match Between System and the Real World

Immersed used real-world counterparts, like conference rooms, whiteboards, and locks, to meet users' expectations and existing mental models.

Usability of VR

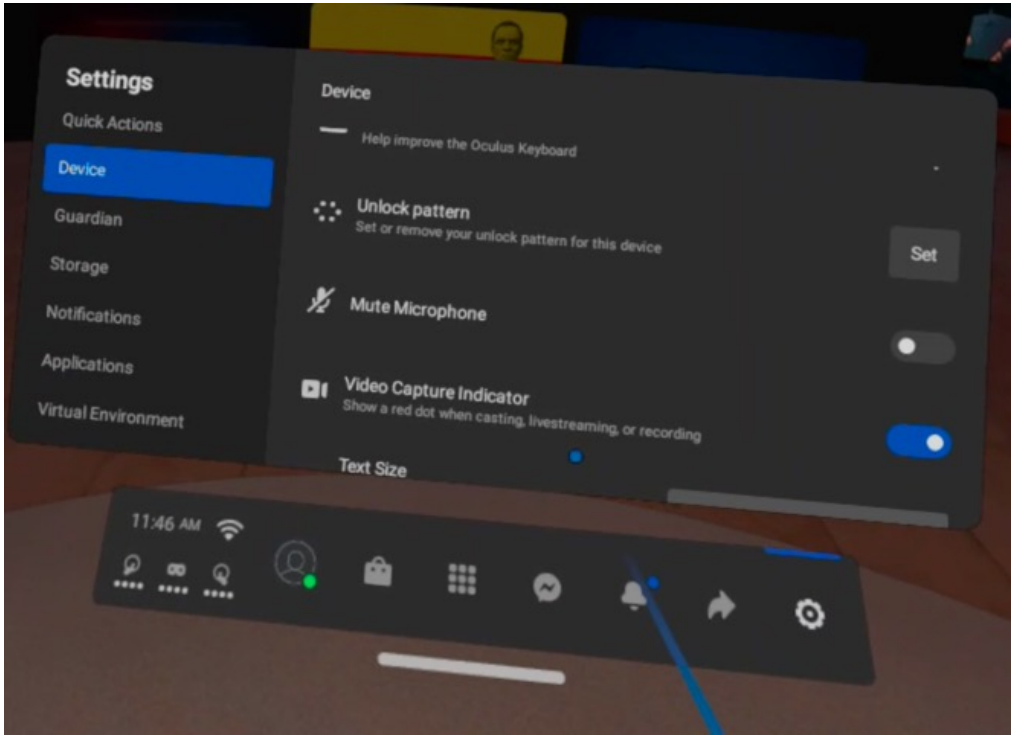
- User Control and Freedom



Beat Saber offered a Cancel button to users on the avatar-customization page. If multiple customizations were made within one session, users could select the Back button to revert to the previous avatar.

Usability of VR

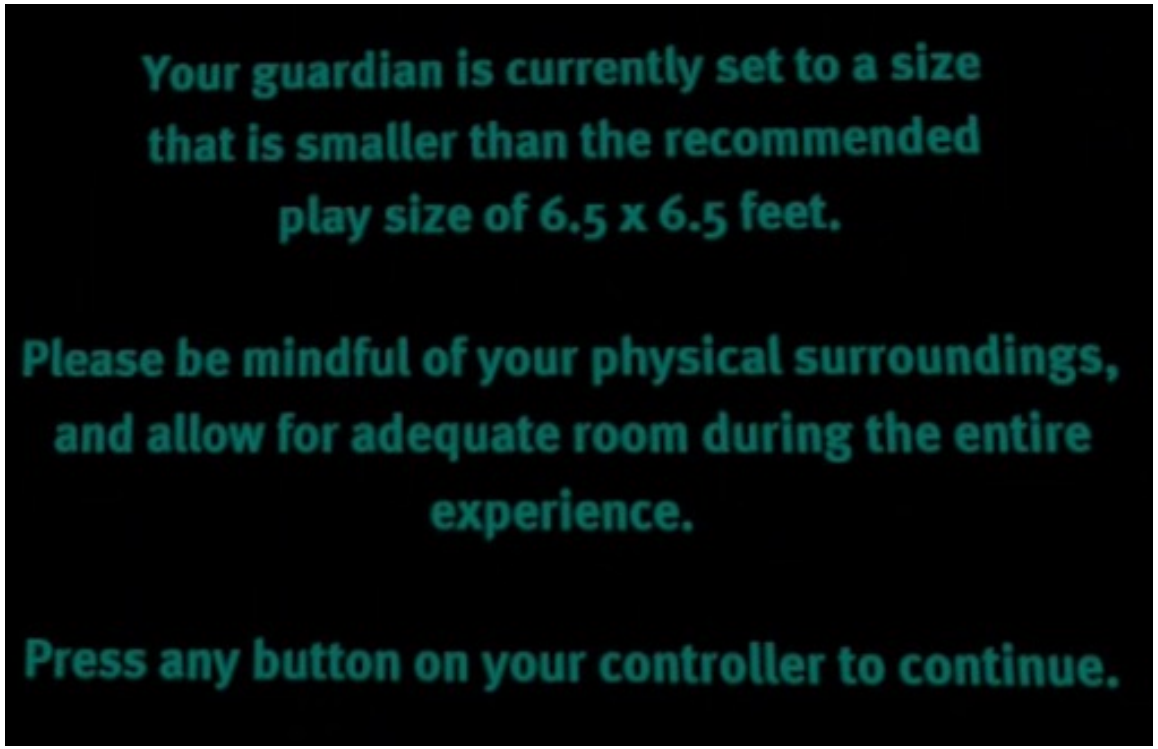
- Consistency and Standards



Oculus followed the design standard for toggle switches.

Usability of VR

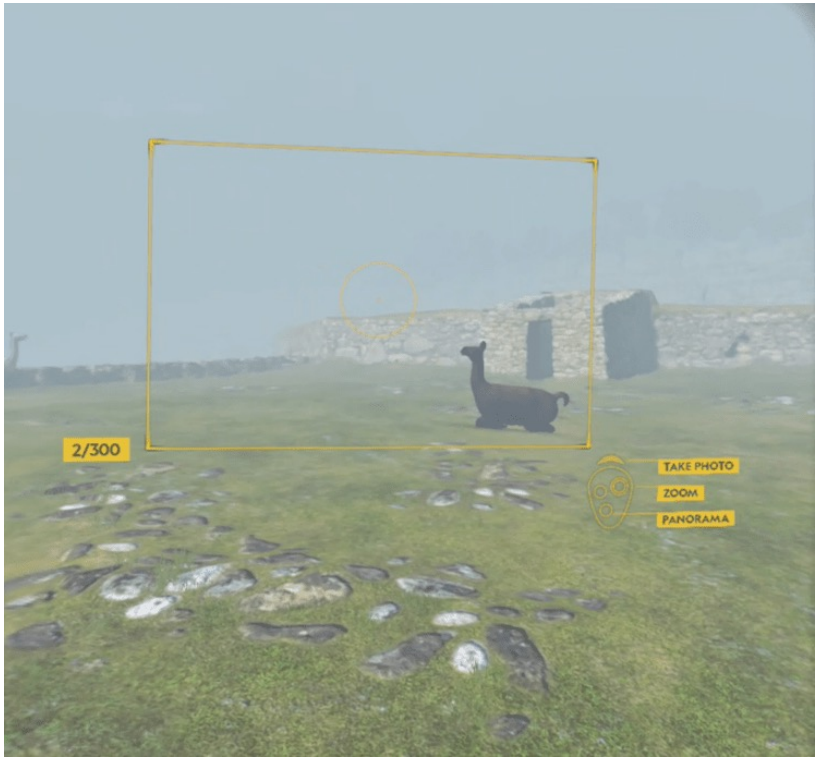
- Error Prevention



Vader Immortal prevented errors and accidents by warning players who set a guardian that was smaller than the recommended size.

Usability of VR

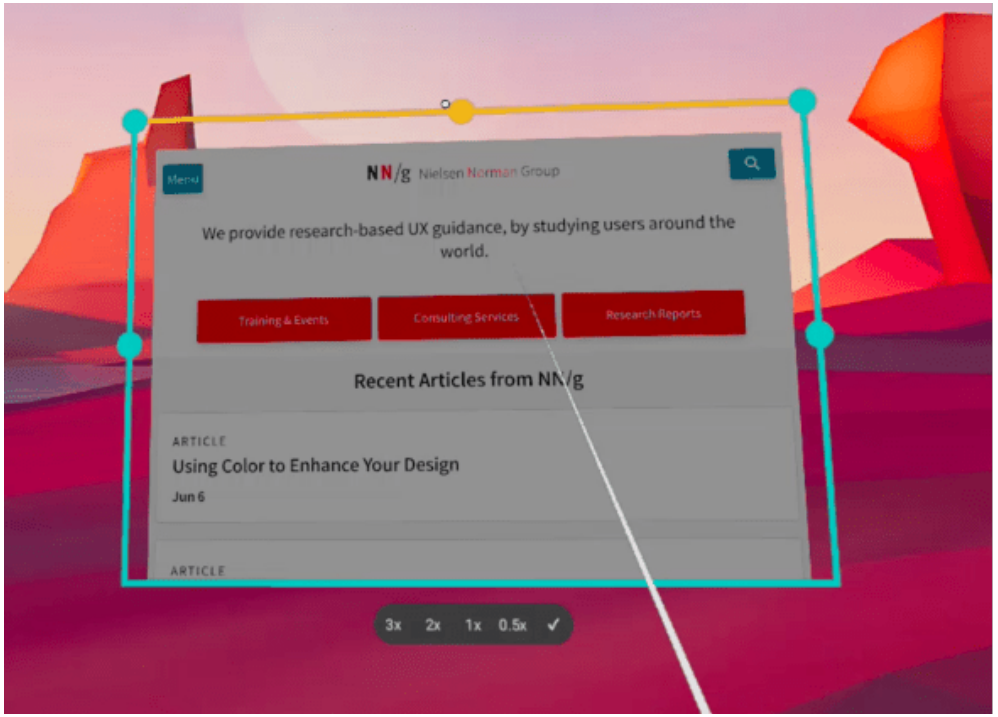
- Recognition Rather than Recall



National Geographic Explore VR reminded users what controller buttons to use to take a picture whenever the camera feature was used.

Usability of VR

- Flexibility and Efficiency of Use



Firefox Reality offered users the flexibility to tailor their browser window size.

Ability-Based Design Principles

Principle	Definition	VR Devices
Adaptation	Interfaces may be self-adaptive or user-adaptable to provide the best possible match to users' abilities.	VR HMDs could allow users to position adjustment knobs to more convenient locations.
Transparency	Interfaces may give users awareness of adaptations and the means to override, discard, retrieve, preview, and test those adaptations.	VR controllers could be modular, allowing users to change their configurations or substitute other controls, e.g., switches, eye gaze.
Performance	Systems may regard users' performance, and may monitor, measure, model, or predict that performance.	Motion controllers could detect tremor and inform interfaces to make targets larger.
Commodity	Systems may comprise low-cost, readily available commodity hardware and software.	Low cost input devices such as dials, sliders, and trackballs could be used to create chairable input controls for VR systems.

Accessibility Guidelines of VR

- Alternative Input Methods
  - Voice input
  - Alternative controllers
  - Gaze
- Audio considerations for users with hearing impairments:
  - Allowing control of the audio balance
  - Providing communication redundancy with visual feedback.

Accessibility Guidelines of VR

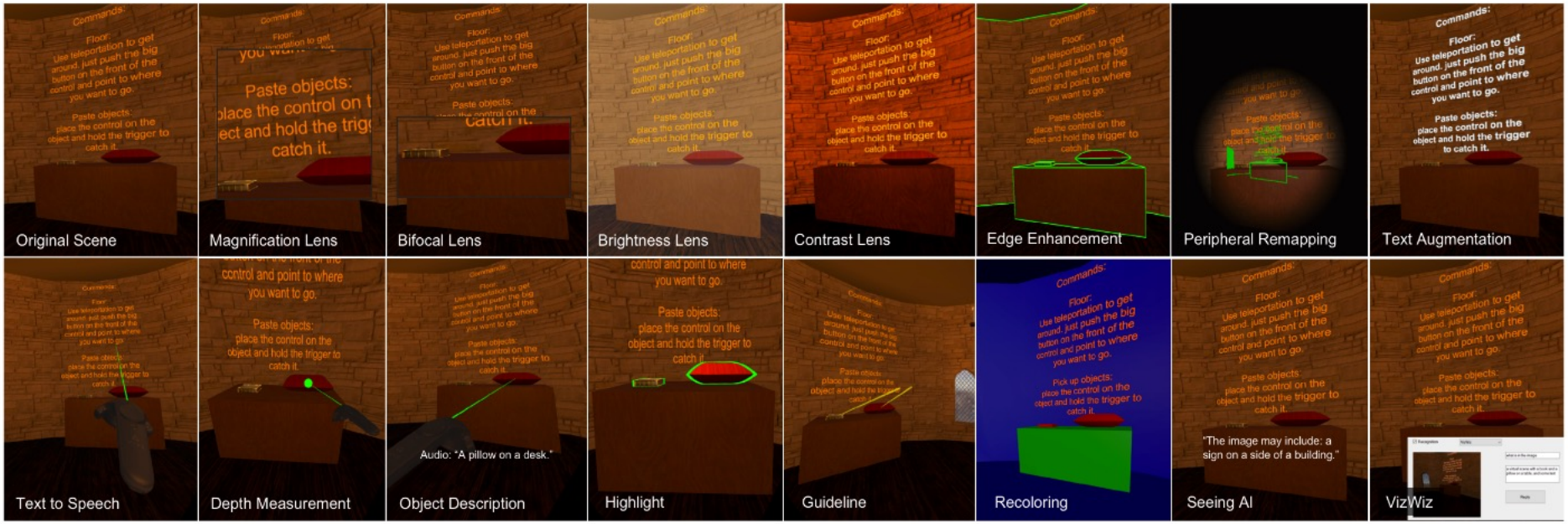
- Visual considerations:
  - Color blind
    - Choose image layouts that are discriminable in grey scale
    - Use other cues such as shape, labels and haptics.
  - Reduced visual acuity
    - Consider providing pre-recorded voice over for all text, or a text to speech engine.
  - Photosensitive epilepsy can be triggered by certain types of visual content.
    - Avoid high contrast flickering content in your content scenes.

Accessibility Guidelines of VR

- Mobility considerations:
  - Allow for play to be experienced from a bed, or a fixed seated location, or a wheelchair
  - People with reduced range of motion may need small, precise movements to be amplified.

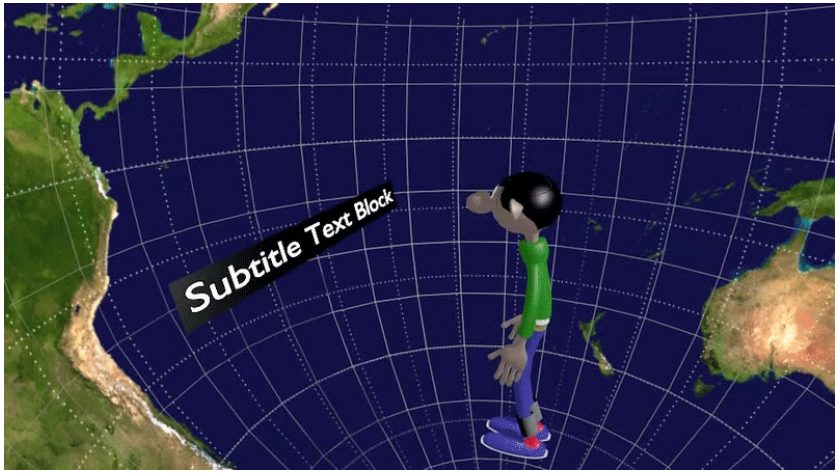
Accessibility of Mainstream VR

- SeeingVR
  - A set of 14 tools for people with visual impairment
    - Plugins for mainstream VR
    - Unity toolkit



Accessibility of Mainstream VR

- WalkinVR Driver
  - Virtual motion and rotation
  - Kinect detect hands to replace controllers
- Subtitles for 360° content



https://www.bbc.co.uk/rd/blog/2017-10-subtitles-360-video-virtual-reality-vr

Discussion

- What are the benefits of VR for PWD?

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- What are the risks of VR for PWD?

Discussion

- What are the benefits of VR for PWD?
- What are the risks of VR for PWD?
- How to mitigate the risks?

References

- XR Accessibility User Requirements
- Virtual, Augmented, and Mixed Reality for People with Disabilities
- Magic Leap accessibility
- 10 Usability Heuristics Applied to Virtual Reality
- SeeingVR: A Set of Tools to Make Virtual Reality More Accessible to People with Low Vision
- Understanding the Accessibility of Virtual Reality for People with Limited Mobility