

ToiletPaper #1

Dos and don'ts in the Virtual Space

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✗ Problem

Virtual reality is now undergoing a rapid development and is becoming increasingly popular. Unlike with traditional Human Machine Interfaces, there are some peculiarities which the designers and programmers of applications have to bear in mind in virtual space.

Overall, **approx. 60% of the cerebral cortex** is involved in processing **visual stimuli** [1]. With virtual reality, we completely take over this sense, which allows strong immersion [2], but also gives us a great responsibility [3]. For when the signals of the **sense of equilibrium and visual perception** no longer fit together, this may soon result in discomfort, so-called **motion sickness**.

✓ Solutions

Do

- Present a visual **"anchor"** which is not moving relative to the user
- Keep the **camera speed as constant** as possible if movement is necessary
- Make the user **sit down** (then he can't fall over ;o)
- Pay attention to the **camera height** and the size of the user (is the user sitting or standing?)
- Attractive, **consistent graphics** instead of hyperrealism
- Force **mixed reality** (fade in headset camera) instead of VR interruptions
- **3D audio** for complete immersion

Don't

- Show **UI elements fixed on the screen** instead of anchored in the world (breaks the realism)
- Present UI elements **too close** in front of the user (then he has to squint to see them)
- Show UI elements **too far away** (may cause a false occlusion of objects)
- Acceleration of the camera not caused by the **movement of head**, especially sideways movements (strafing)
- **"Recording"** of the tracking in spite of head movement
- Rendering less than **60 frames per second**
- More than **20ms tracking-to-display latency** [4]

➔ Examples

- Displaying a **cockpit** in a vehicle or spaceship
- **Teleport** of the virtual persona instead movement through controller

+ Further aspects

- [1]: <http://www.allpsych.uni-giessen.de/karl/teach/aka.htm>
- [2]: [https://de.wikipedia.org/wiki/Immersion_\(virtuelle_Realit%C3%A4t\)](https://de.wikipedia.org/wiki/Immersion_(virtuelle_Realit%C3%A4t))
- [3]: <https://www.youtube.com/watch?v=2cOlgPMY5Mc>
- [4]: <http://oculusrift-blog.com/john-carmacks-message-of-latency/682/>
- <https://play.google.com/store/apps/details?id=com.google.vr.cardboard.apps.designlab>
- <https://www.google.com/design/spec-vr/designing-for-google-cardboard/a-new-dimension.html>