# PITFALLS AND PERILS OF VR: HOW TO AVOID THEM

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# SOMETIMES, THINGS GO WRONG…

Getting the user from 2D to the Rift

Creating UI for VR:

- Existing UI conventions don't work on the Rift

Creating a comfortable user experience:

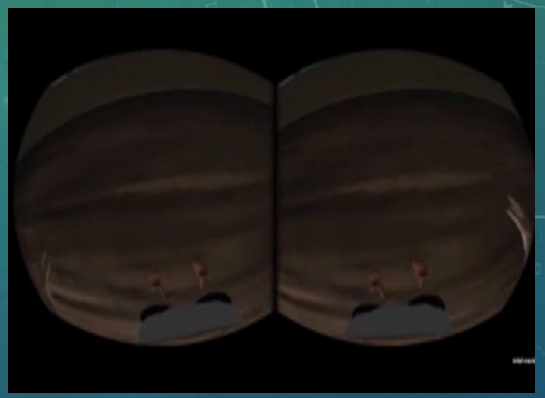
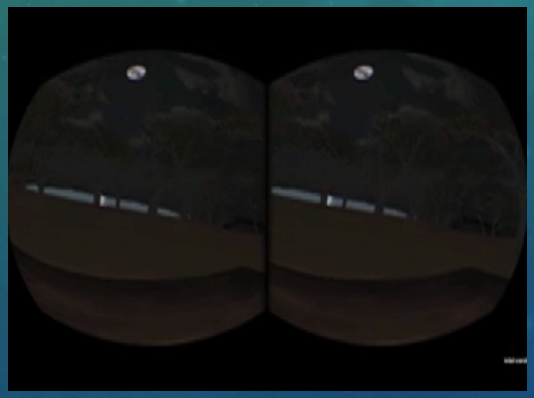
- Motion sickness and cutscenes

# GETTING THE USER FROM 2D TO THE RIFT

Providing a good VR experience for the user starts *before* the game starts.

# A BAD START



This series of pictures shows a bad start. The user fumbles with getting the Rift on and then must turn using the gamepad to be in a position where they can start the game.

# A BAD START

That wasn’t immersive!

- The user’s avatar is facing the wrong direction and the user can’t easily interact with the game.
- The user’s avatar height and IPD are significantly different than their own, causing some user disorientation.
- The user isn't aware that there are safety considerations to using the Rift.
- The user isn't comfortable being the avatar chosen.

That's a lot of pitfalls and the we haven't even started the game yet!

# PITFALL: ASSUMING THE USER IS ALREADY WEARING THE RIFT

If you don't know if the user has the Rift on or not:

- You can't be sure the user is seeing the content you are displaying.
  - Reconsider splash screens, opening cinematics, loading menus…
- You don't know if “forward” in the real world matches “forward” in VR.
  - The Rift could be hanging on a peg when your app launches
  - SteamVR will reduce this, but users will still launch apps from the desktop
- You risk disorienting the user when they *do* enter VR

# SOLUTION: LET THE USER CONFIRM THAT THEY'RE IN VIRTUAL REALITY

- Don't assume that the Rift is in use until the user says so
- Ask them to hit a particular key or look a certain way to confirm

# SOLUTION: USE THE SAFETY WARNING

0.4.x comes with a safety warning that must be displayed before the start of any Rift Game.

ProTip: this can be a great way to see if the user is *really* ready to start using your app.

# SOLUTION: GIVE THE USER A WAY TO RECENTER

The DK2's camera gives us great positional tracking, but don't assume that it's directly in front of the user and that's enough to know where they are.

- It could be above or below, near or far
- The user may move after they've launched your app

Instead, always give users an option to recenter their virtual selves: a quick keypress to realign their virtual camera to their avatar's current facing.

- This is especially critical if you plan to support older-model DK1 Rifts, which are subject to `drift'.

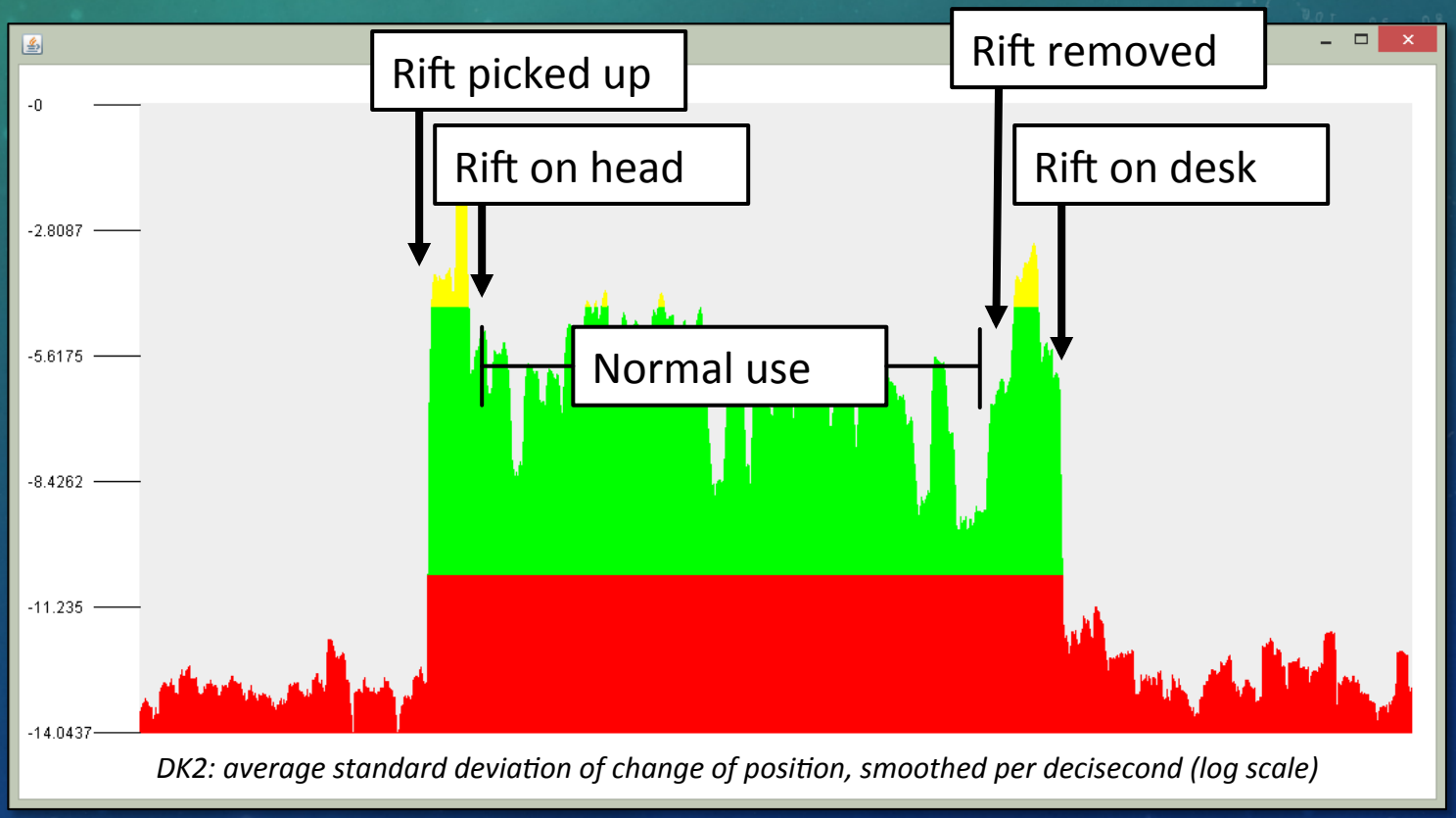
# IS THE RIFT BEING WORN?

You can parse the Rift's positional tracking data to know when the user is wearing the headset.

This graph shows the `noise' of the Rift's position when it's on a desk or on a user's head.

Desk: *(approx.)*
log(σ) < -10.5

Head: *(approx.)*
log(σ) < -4.5




*DK2: average standard deviation of change of position, smoothed per decisecond (log scale)*

# PITFALL: ASSUMING THE USER CREATED A PROFILE

If the user has not created a profile,

- The user may experience discomfort because the default IPD or height is different from their own.
  - Discomfort leads to simulation sickness.
  - Sim sickness leads to hate.
  - Hate leads to the dark side.
- The user may feel awkward with the avatar used
  - The (age, race, gender, etc.) of the avatar may not match what the user prefers
  - Some users aren't comfortable with an avatar whose motions don't match their own; they may feel more comfortable without an avatar

# HELP THE USER TO CREATE THEIR PROFILE

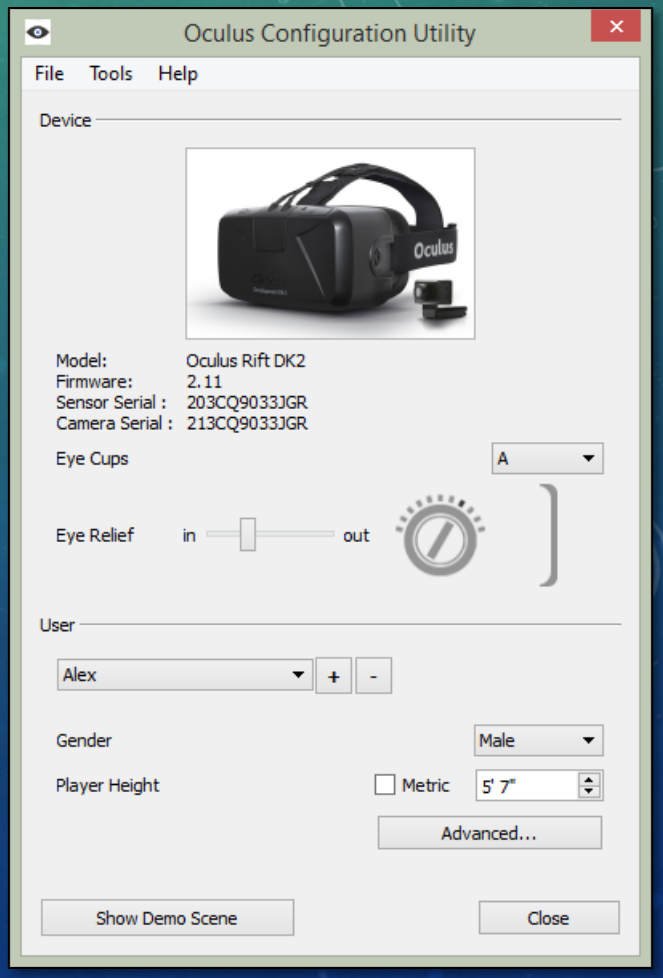
Stress the importance of creating a profile in the documentation.

Show the user which profile is currently in use.

To get the current user profile, use:

```
ovrHmd_GetString(hmd, OVR_KEY_USER, "")
```

If **`default`** is returned, prompt the user to create a profile.



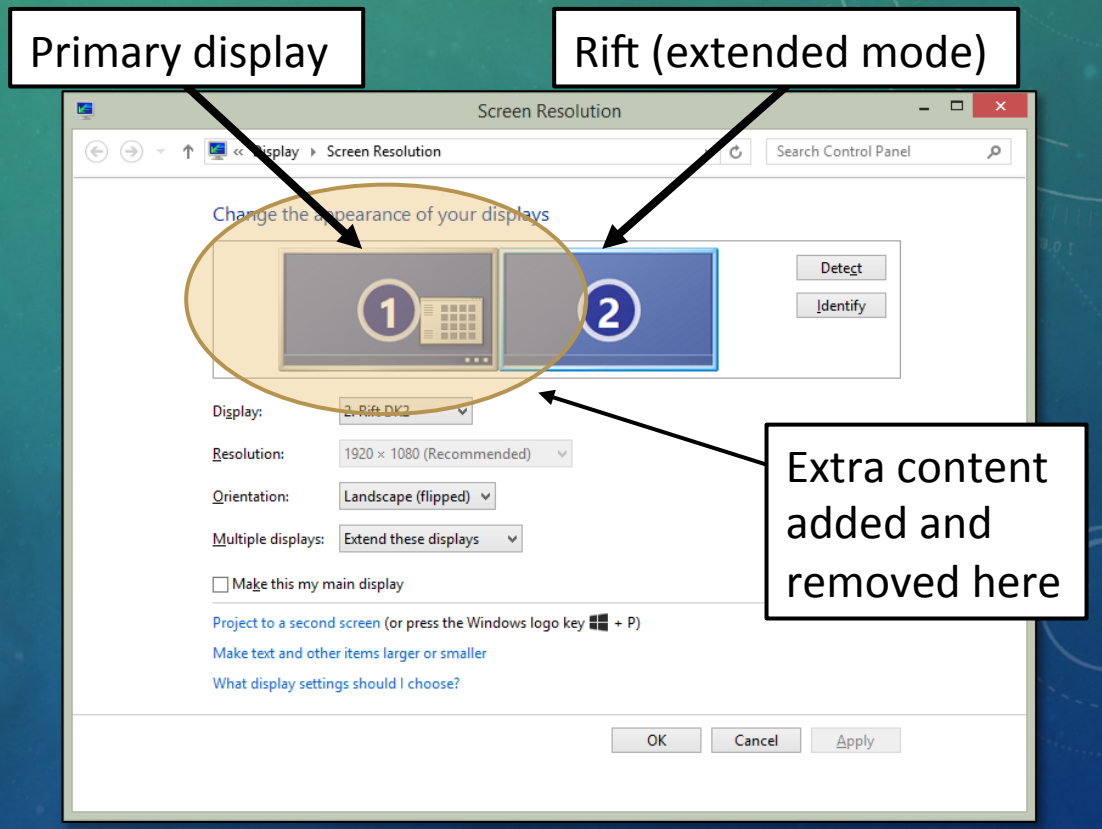
# PITFALL: NOT PROPERLY DETECTING THE RIFT DISPLAY

- Far too many games and demos do this!
  - The new Direct HMD mode will help, but if the Rift is in Extended mode, then this is still a problem.
- Use the SDK and your graphics library to identify the Rift and the primary monitor.
  - Not sure which screen is the Rift? Let the user configure where their app opens.
    - This *should* be an easy configuration setting in conventional UI
    - Log what's going wrong if you can't enable the Rift

# USE THE DESKTOP FOR AUXILIARY CONTENT

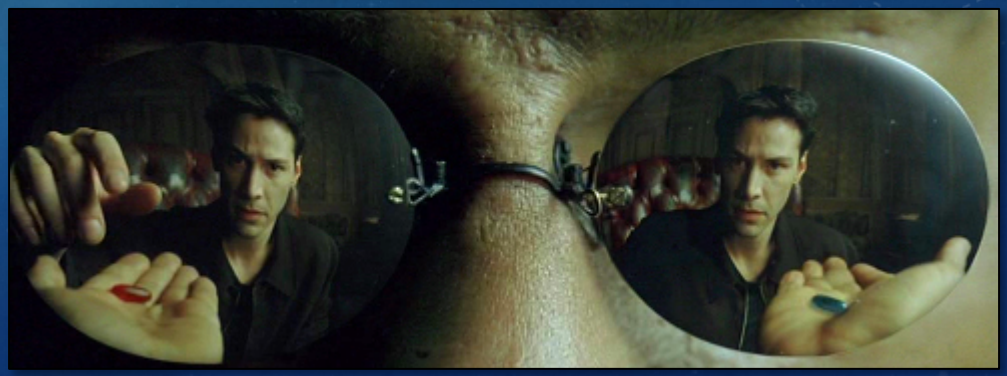
The Rift is a second monitor. If the user isn't wearing their Rift yet, odds are that there's another screen you could be showing great content on.

The primary monitor can become a second screen, perfect for extra content and a friendly experience when the headset's off.



# ALLOW THE USER TO TOGGLE VR MODE

- Give the user an option to toggle between a VR display and a traditional display.
- Don't 'trap' the user in VR.
- This improves usability, and gives them a path back to your app later.



# A BETTER START

- The app loads onto the Rift, or if it can't identify the Rift in their OS, it's easy to move the app from one desktop to another.
- The user launches the app, acknowledges the safety warnings, and has easy access to the user settings.
- The user is comfortable with the avatar used and with the height and IPD settings used; warn if no profile is configured.
- UI and events that are designed for headtracking don't kick in until the user has the headset on.
- The user's avatar is facing the direction needed for best immersion.

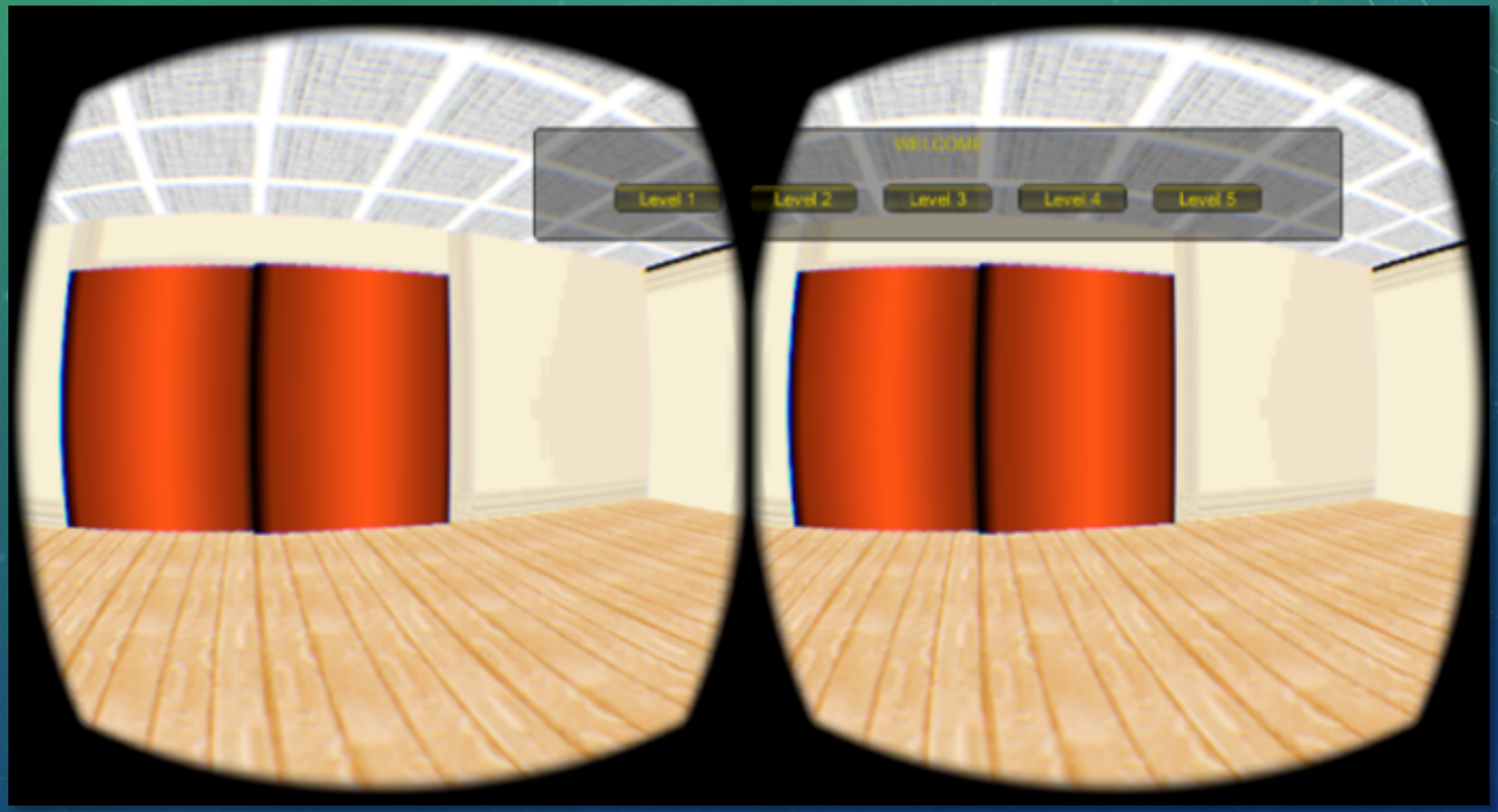
# PERIL: EXISTING UI CONVENTIONS DON'T WORK ON THE RIFT

Providing a good UI for the Rift means rethinking UI from the ground up.

# PITFALL: USING A 2D OVERLAY

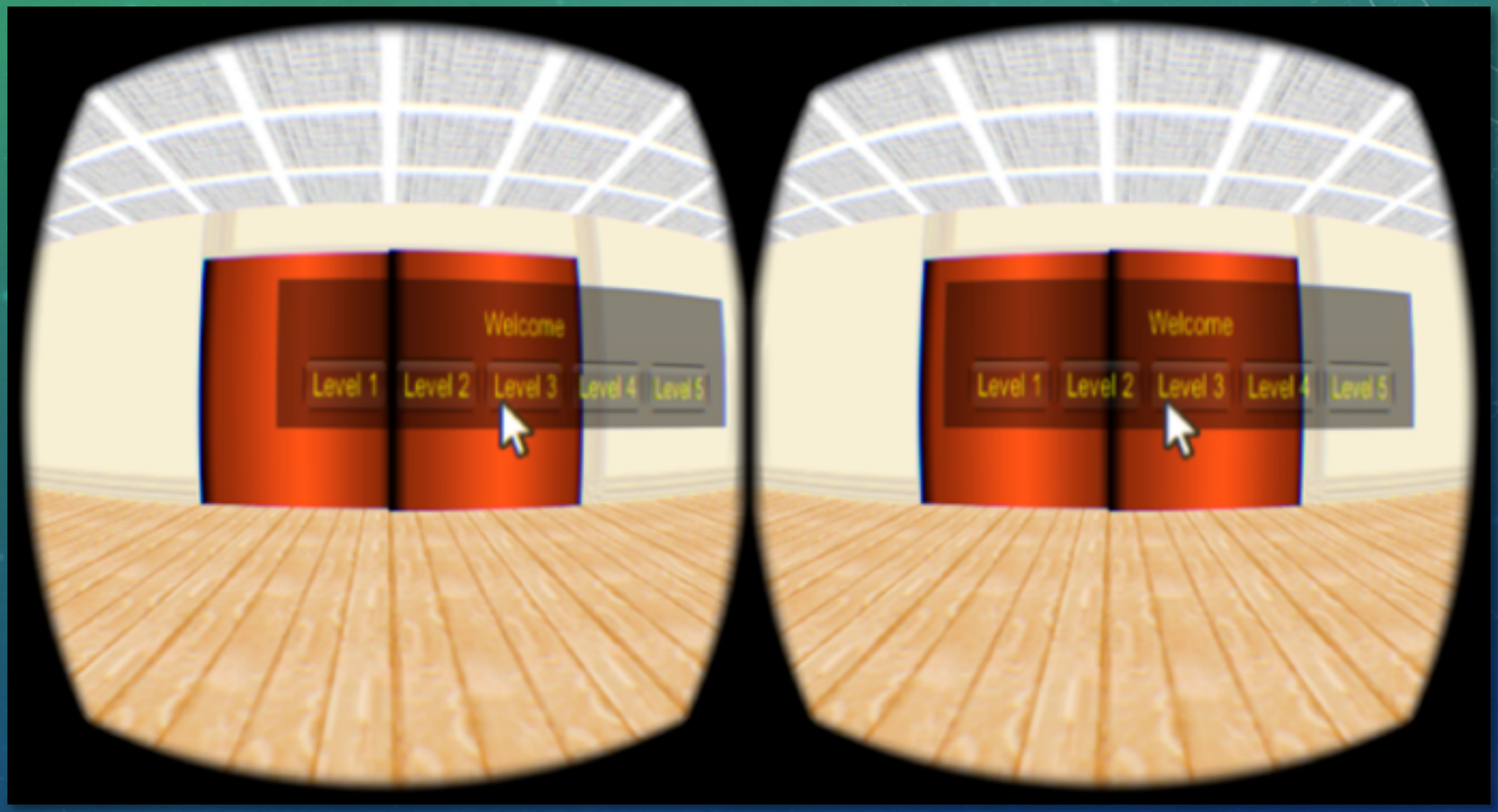

A 2d overlay as seen on a conventional monitor.

# PITFALL: USING A 2D OVERLAY




The same 2d overlay as seen on the Rift

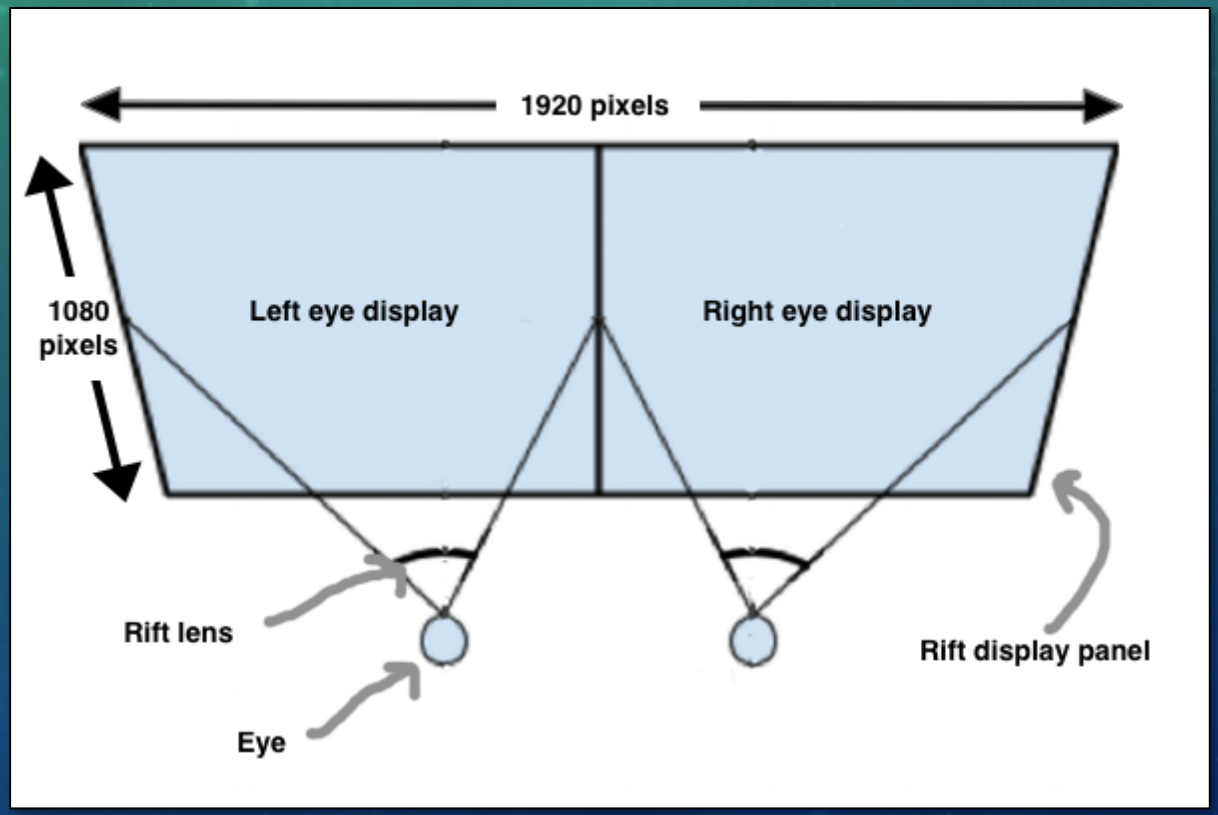
# THE UI MUST BE RENDERED IN 3D SPACE

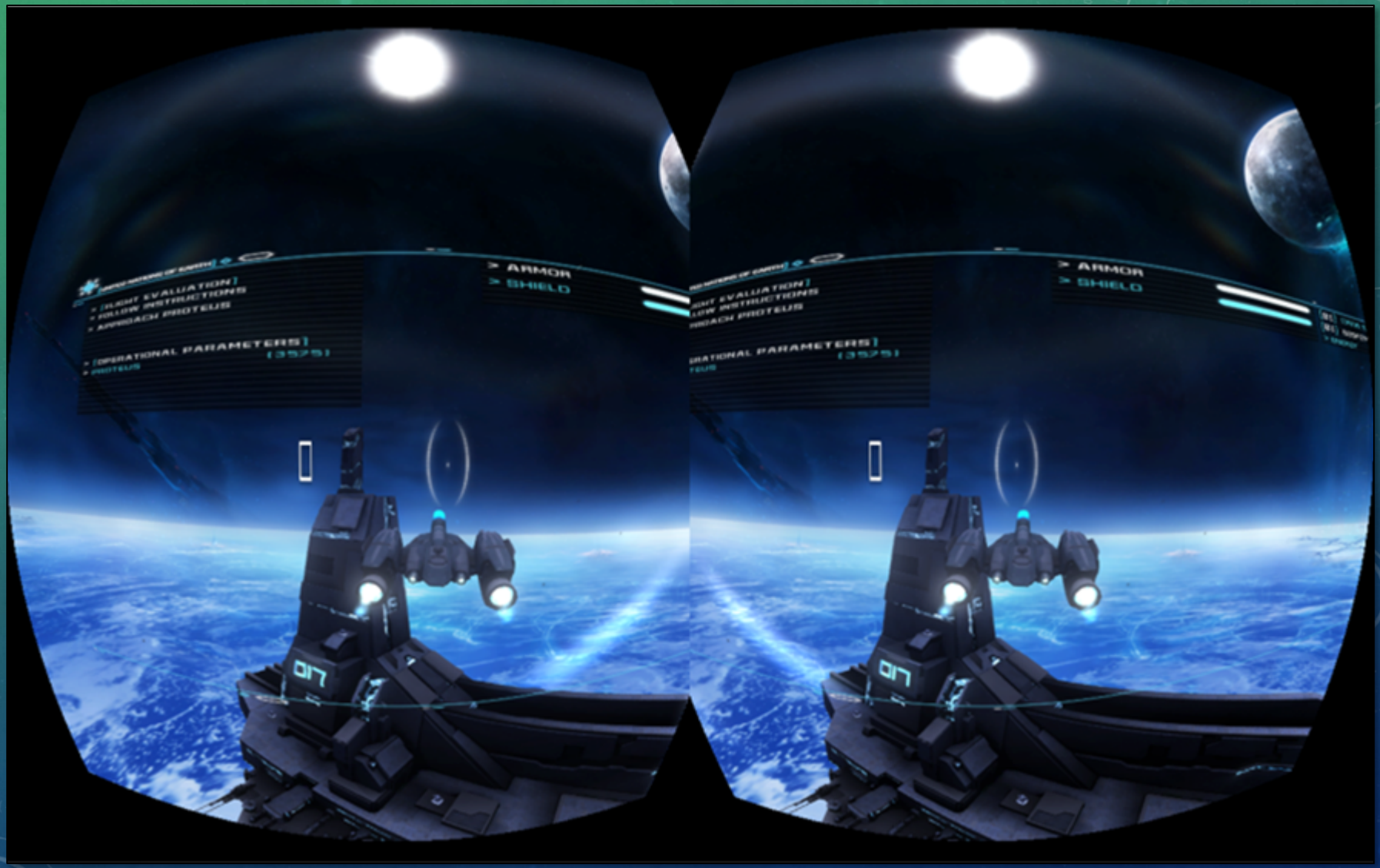



Embedded into the virtual scene

# PITFALL: MAKING ASSUMPTIONS ABOUT SCREEN ASPECT RATIO

Unlike conventional monitors, the Rift is taller than it is wide.






Strike Suit Zero, Born Ready Games (2012).

# PITFALL: CREATING A VIRTUAL SCREEN PINNED TO THE USER'S PERSPECTIVE


Team Fortress 2, Valve

# PITFALL: DESIGNING FOR “SCREEN” SPACE

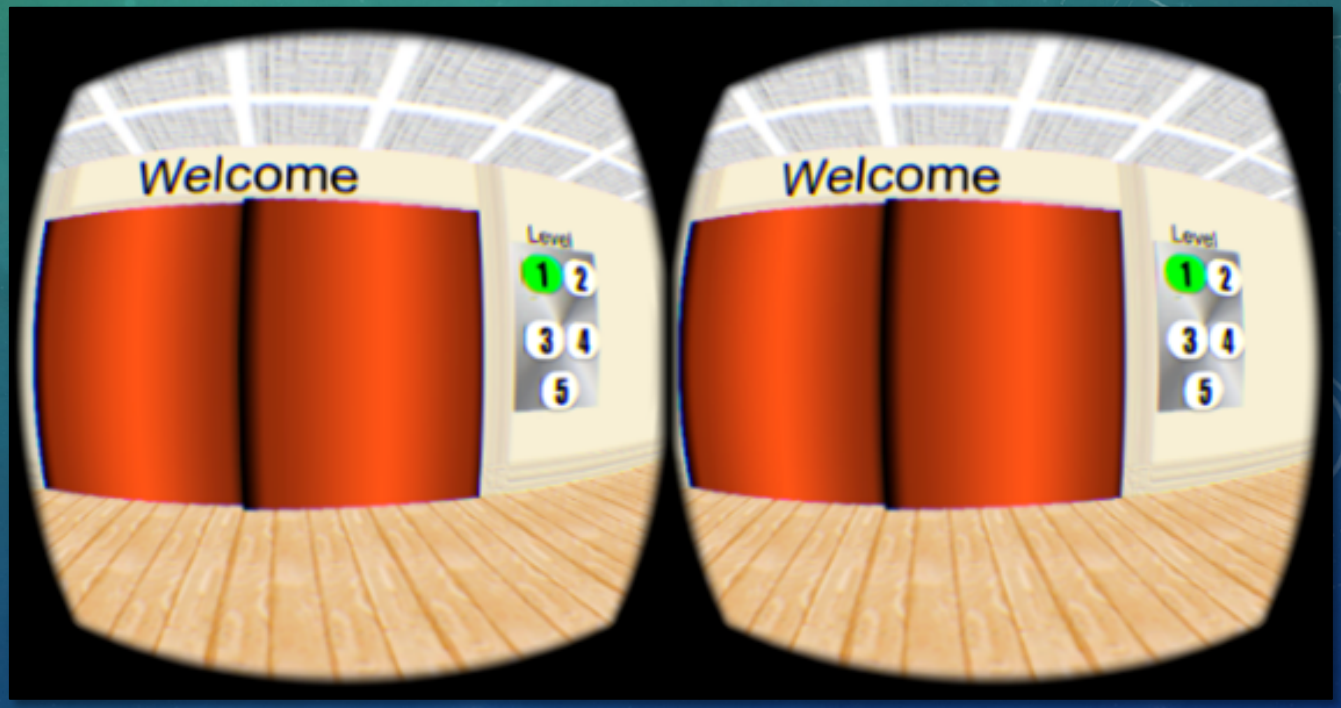
- There is nothing between you and the virtual environment.
- The user’s perspective does not have useful edges or corners.
  - The edges of the view lose the most resolution under the distortion function.
  - Users may see different amounts of content towards the edges, and objects placed there could be completely outside their field of view.
  - Rolling your eyes to view something causes eyestrain.
- UI elements that derived utility from their relation to the frame of the screen have lost their place.

# PITFALL: FLOATING WIDGETS CAN BREAK IMMERSION

# SOLUTION: USE “NO UI”

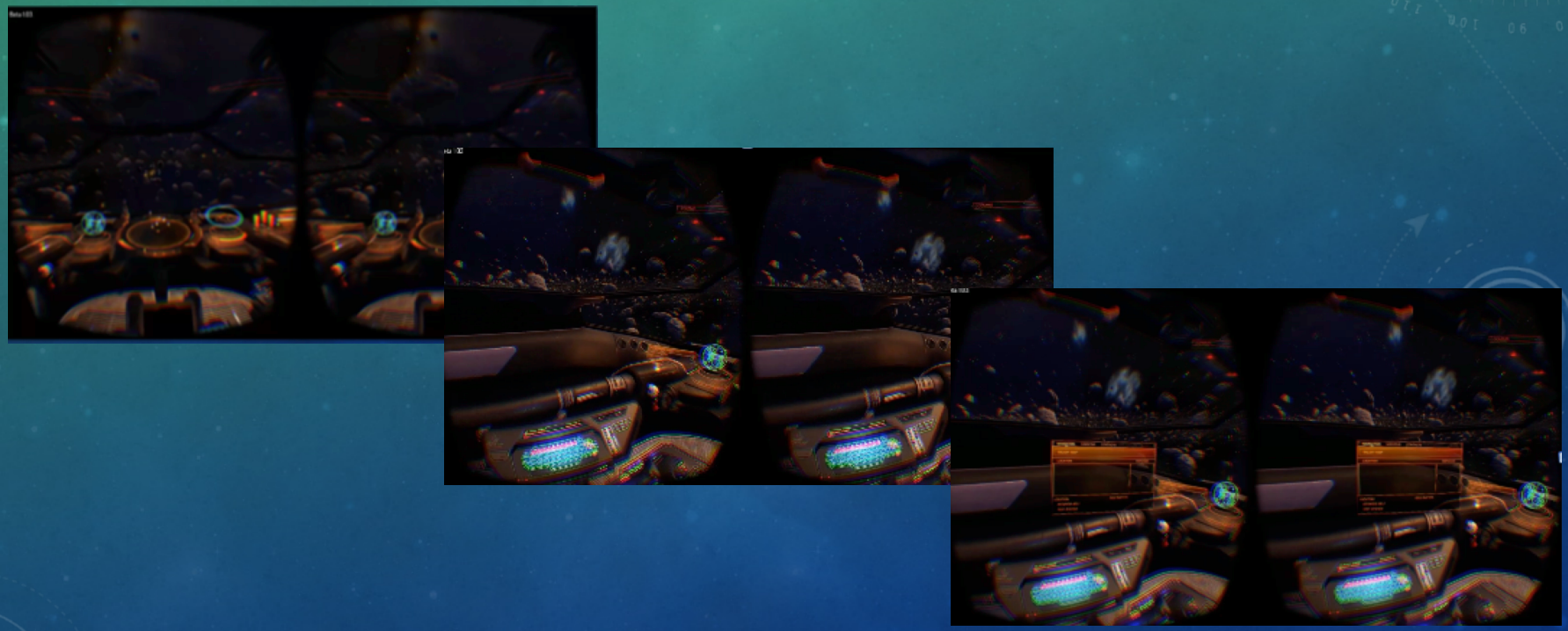
If you can, try to build your UI *into* your world.

In an immersive experience, user interface must be immersed as well.



# SOLUTION: USE “ON DEMAND UI”

If the UI is too complex to persist, let gaze direction trigger interface elements.



*Elite: Dangerous*, Frontier Development (in development)

# JUSTIFY YOUR UI

- Whatever solution you choose, justify it in your world; choose a UI that fits the fiction of your virtual reality.

A HUD works well in an
"Iron Man" universe

A HUD doesn't work  so well
in a "My Little Pony" universe

# PITFALL: SIMULATION SICKNESS AND CUTSCENES

The golden rule of VR comfort: **The user is in control of the camera**

Showing non-interactive content can be challenging. VR isn't film.

# PERIL: SIMULATION SICKNESS

**The user is in control of the camera**

- Head tracking must match exactly what the user is doing (both rotation and position)
- The user's position can be changed, but it must be done in a way that the user expects (cockpit metaphor, moving walkway, etc.)
- The field of view is fixed to that of the Rift.

# SIM SICKNESS MEANS THAT CUTSCENES ARE A CHALLENGE

Modern AAA games are comparable to movies.

- They use *cutscenes* to advance the story
- Typically the cutscene uses first- or third-person narrative and live or in-engine footage

Cutscenes follow movie conventions
- Pans, dissolves, zooms…

*None of these work* in VR, because you can't seize control of the camera.

Cutscenes implicitly assume that you know where the user's attention is focused.
- What if they're looking away?


*Call of Duty: Modern Warfare 3 (Activision, 2012)*
The player's helicopter has been shot down; they emerge into gameplay.

# SOLUTION: PLACE CONTENT ON SCREEN IN SCENE

Your virtual world may have screens of its own.  If it does, use them: they're perfect for prerecorded 2D content.

*The Matrix Reloaded* (2003)

# SOLUTION: DRAW THE USER'S ATTENTION

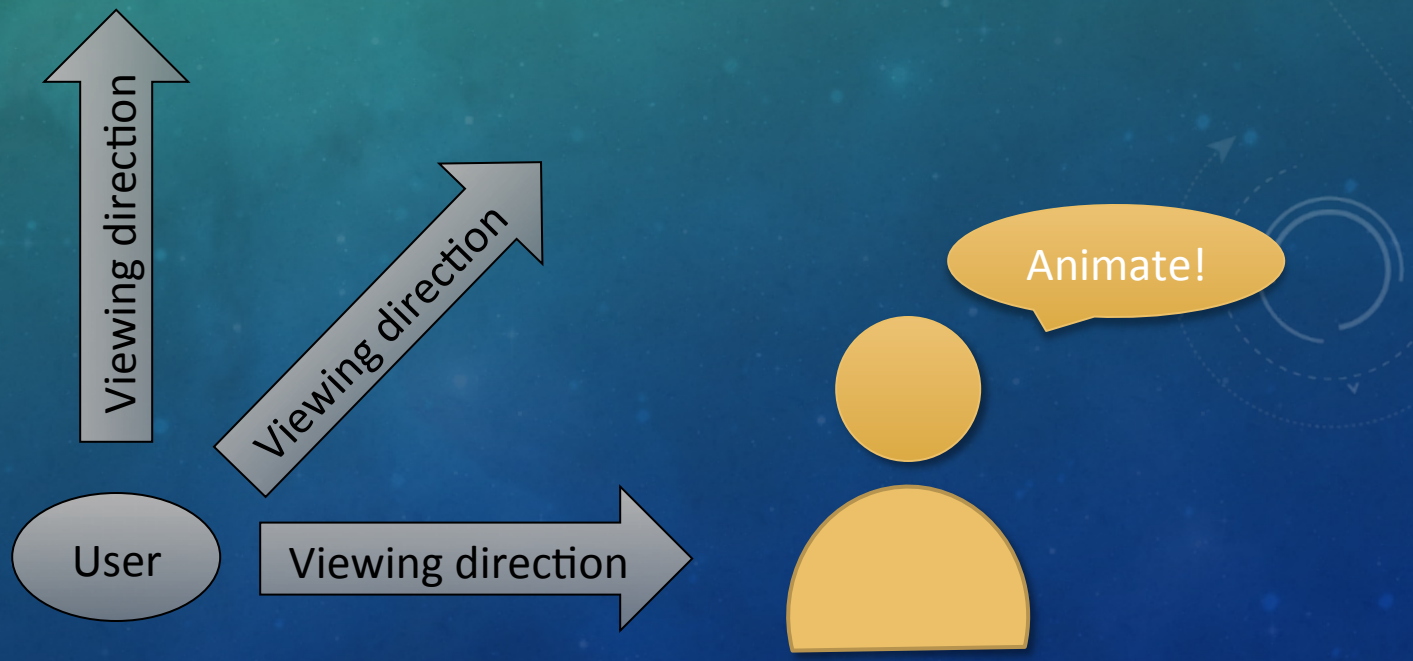
Sometimes, you just have to tell the user where to look.

- Use audio cues, movement or changing lighting or color to draw focus
- Use other characters in the scene; when they all turn to look at something, the player will too
- Design the scene to direct the eye

*The Emperor's New Groove* (2000)

# SOLUTION: RESPONSIVE TRIGGERS

With the Rift, it's not hard to detect when part of the virtual scene is in the camera frustum of the player's view.

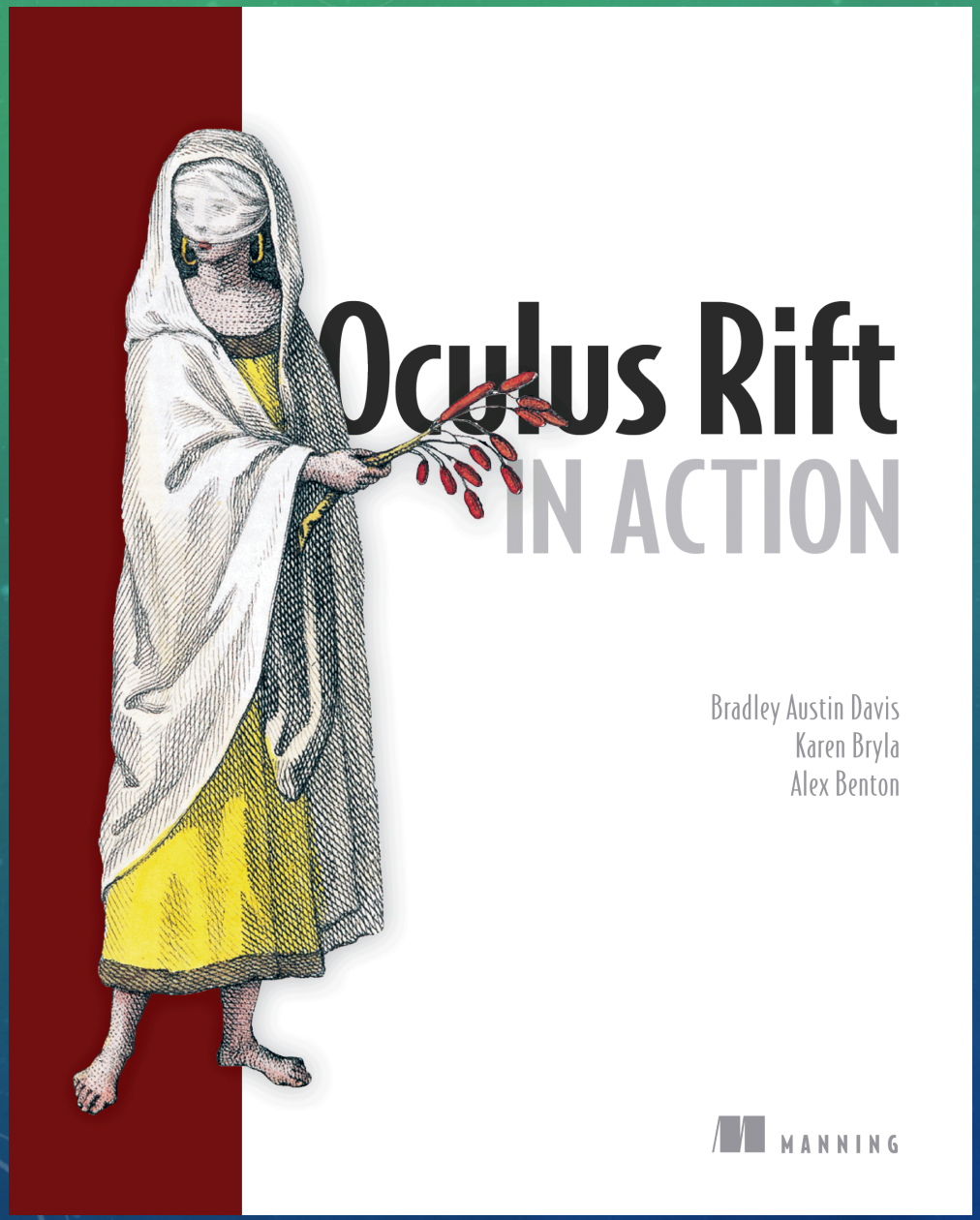


# SOLUTION: GET CREATIVE!

"It's a new communications medium. What is necessary is to develop a grammar and syntax. It's like film. When film was invented, no one knew how to use it. But gradually, a visual grammar was developed. Filmgoers began to understand how the grammar was used to communicate certain things. We have to do the same thing with this."

Neal Stephenson

*Interface,* 1994

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