Creating a VR User Experience Using Unity 3D

Karen Bryla

karen@karenbryla.com
www.manning.com/bdavis
github.com/OculusRiftInAction/OculusRiftInAction

Topics

- Introduction to the Rift and Rift development
- Getting the user from 2D and into VR
- Creating a UI for VR
- Creating a comfortable user experience
- Workshop! Creating a scene that runs on the Rift

Meet the Rift

- The Oculus Rift is a head mounted display + camera.
- The camera detects LEDs in the headset to provide positional data.
- The headset contains sensors to provide rotational data and a display.
- The display isn’t a standard monitor. It requires the Oculus Runtime drivers to work with your OS.
- Oculus Runtime contains a configuration utility to create a user profile.

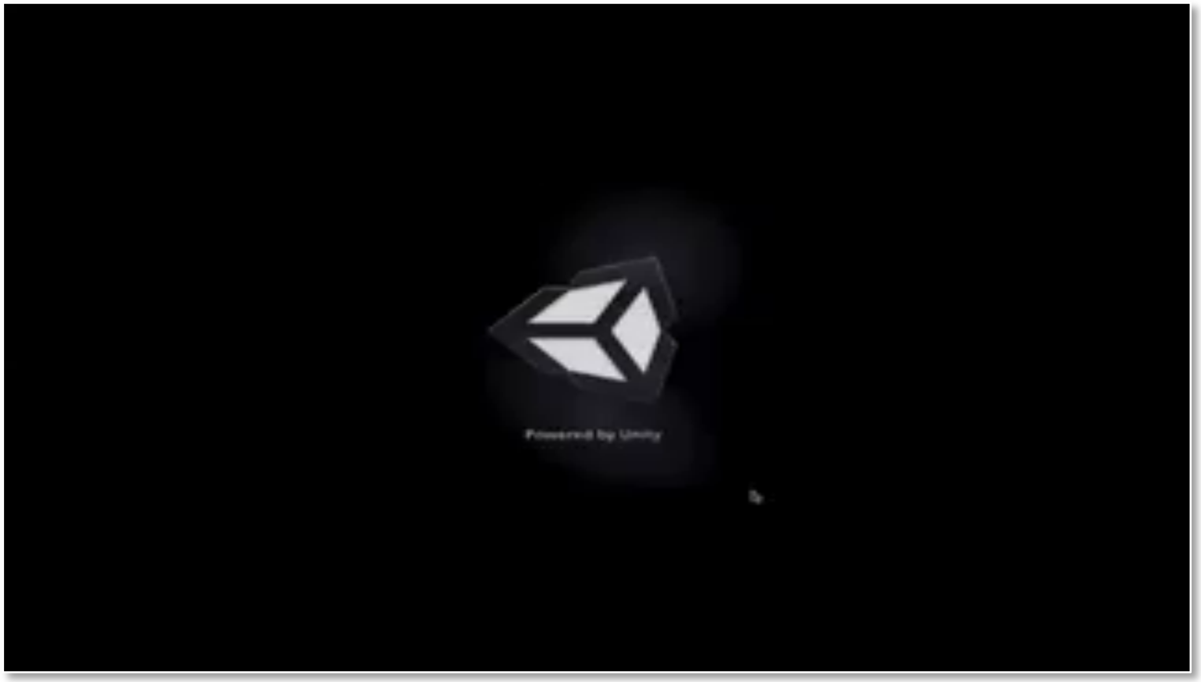
Developing for the Rift

- The Oculus SDK can be used to develop for the Rift using C/C++ directly or you can use a game engine (Unity or Unreal).
- Unity 5.1 has native VR support for the Rift.
- The Oculus Utilities for Unity package is also useful. It contains prefabs for a first person Player character and a variety of scripts and utilities that can be used to improve the VR experience.

Getting the user from 2D and into VR

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

A bad start



What went wrong

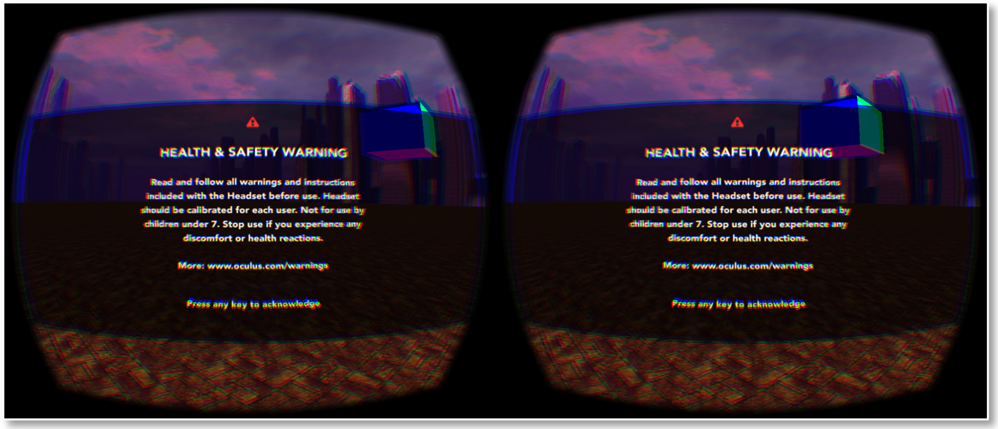
- The user’s avatar is facing the wrong direction and the user can’t easily interact with the game.
- The user’s avatar height and IPD are significantly different than their own, causing some user disorientation.
- The user isn’t aware that there are safety considerations to using the Rift.
- The user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

Use the safety warning

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

The Oculus Utilities for Unity package includes a script that will allow you to check to see if the HSW is displayed. Use:

OVRManager.isHSWDisplayed



HEALTH & SAFETY WARNING

Read and follow all warnings and instructions included with the Headset before use. Headset should be calibrated for each user. Not for use by children under 7. Stop use if you experience any discomfort or health reactions.

More: www.oculus.com/warnings

Press any key to acknowledge

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Give the user a way to re-center

Even with positional tracking, don't assume that's enough to know where the user is. Always give users an option to re-center their virtual selves.

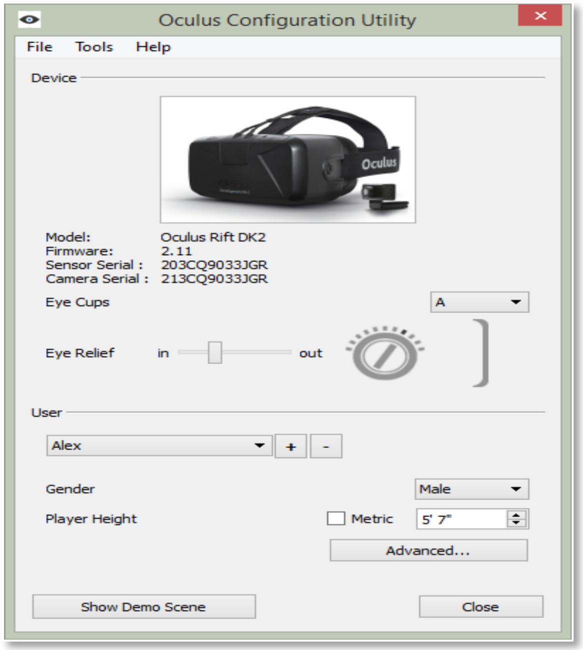
To re-center, add the VR name space (Using Unity.VR) and use:

```
        VR.InputTracking.Recenter()
```

Help the user create 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.

Stress the importance of creating a profile in the documentation.



Model: Oculus Rift DK2
Firmware: 2.11
Sensor Serial : 203CQ9033JGR
Camera Serial : 213CQ9033JGR

Eye Cups: A

Eye Relief: in — out

Alex

Gender: Male

Player Height: □ Metric 5' 7"

Provide avatar options

Help the user feel comfortable with avatar used:

- The age, race, gender, etc. of the avatar may not match what the user prefers. Give the user options and let them select what they want!
- Some users aren't comfortable with an avatar whose motions don't match their own; they may feel more comfortable without an avatar. Give the user the option of no avatar.

Create a better start: Use a splash scene

Using a splash scene provides a place to

- introduce the application
- dismiss the health and safety warning
- get into a comfortable position with the headset on
- re-center their view (and learn how to how to re-center later if needed)
- give them a place to select an avatar that makes them feel comfortable (or no avatar at all!)

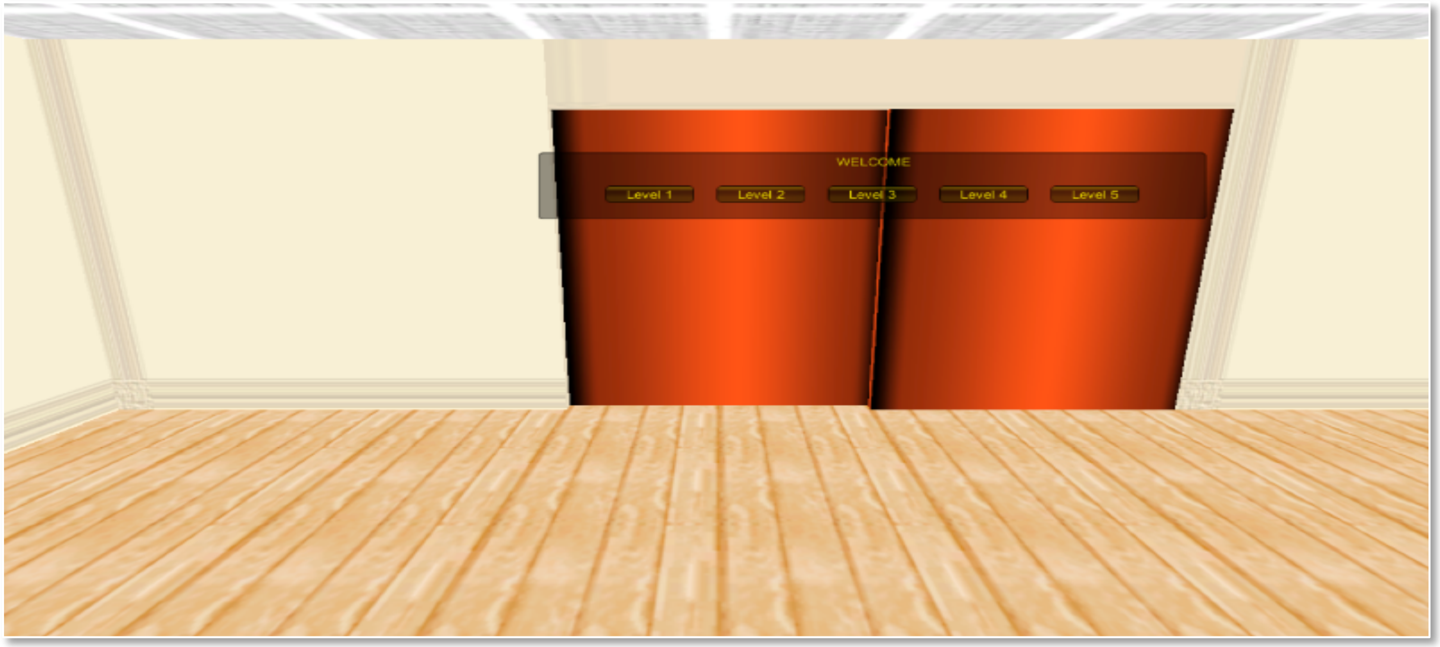
All without missing a second of critical content!

Creating UI for VR

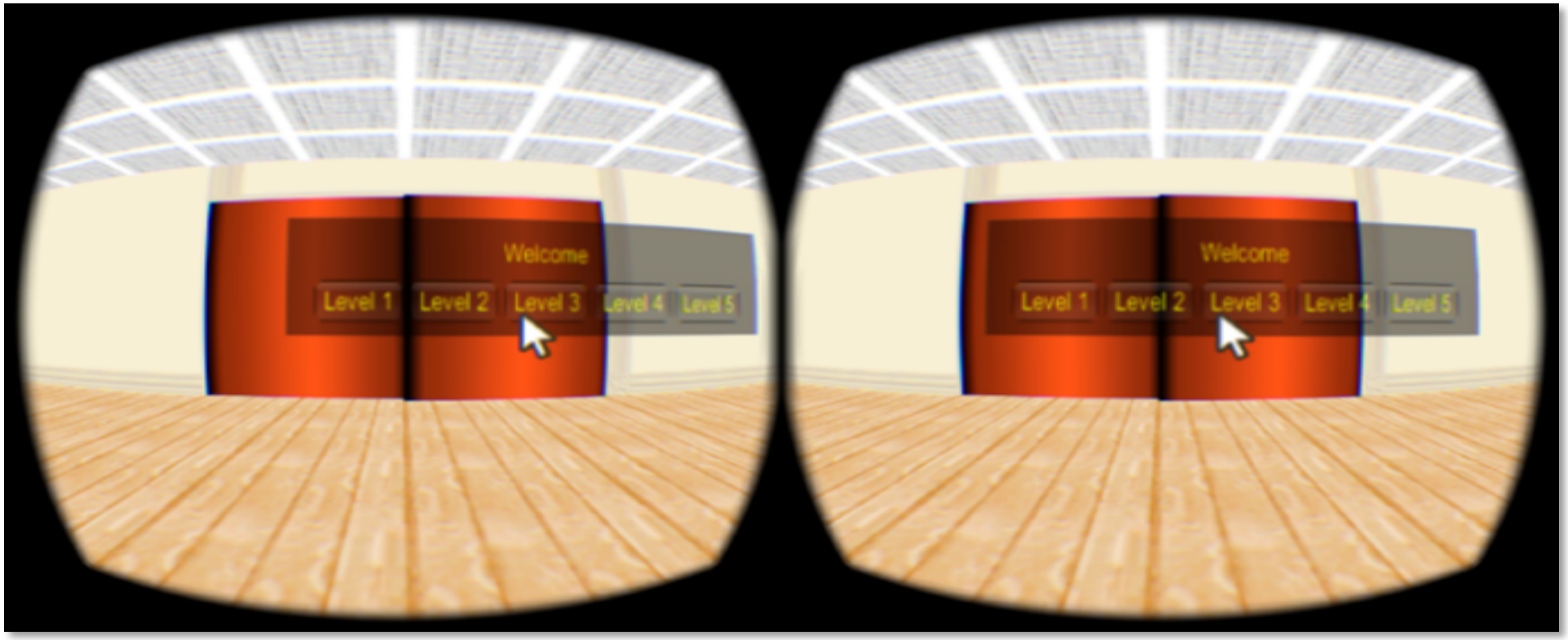
Existing UI conventions don’t work in VR.

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

A typical UI created with a “Screen Space” canvas



Use “World Space” canvases instead



VR doesn’t have a “screen”

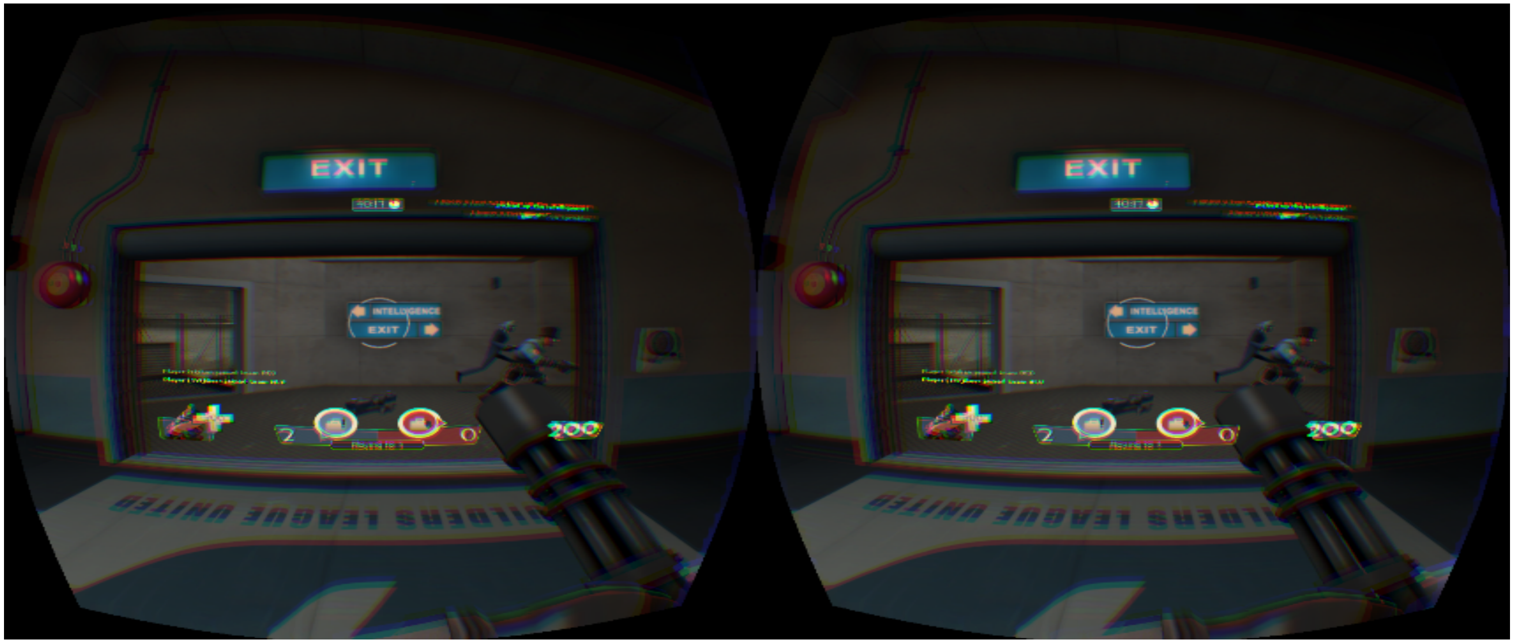
There is nothing between you and the virtual environment.

The user’s perspective does not have useful edges or corners.

- Users may see different amounts of content towards the edges, and objects placed there could be completely outside their field of view.
- The edges of the view lose the most resolution under the distortion function.
- Rolling your eyes to view something causes eyestrain.

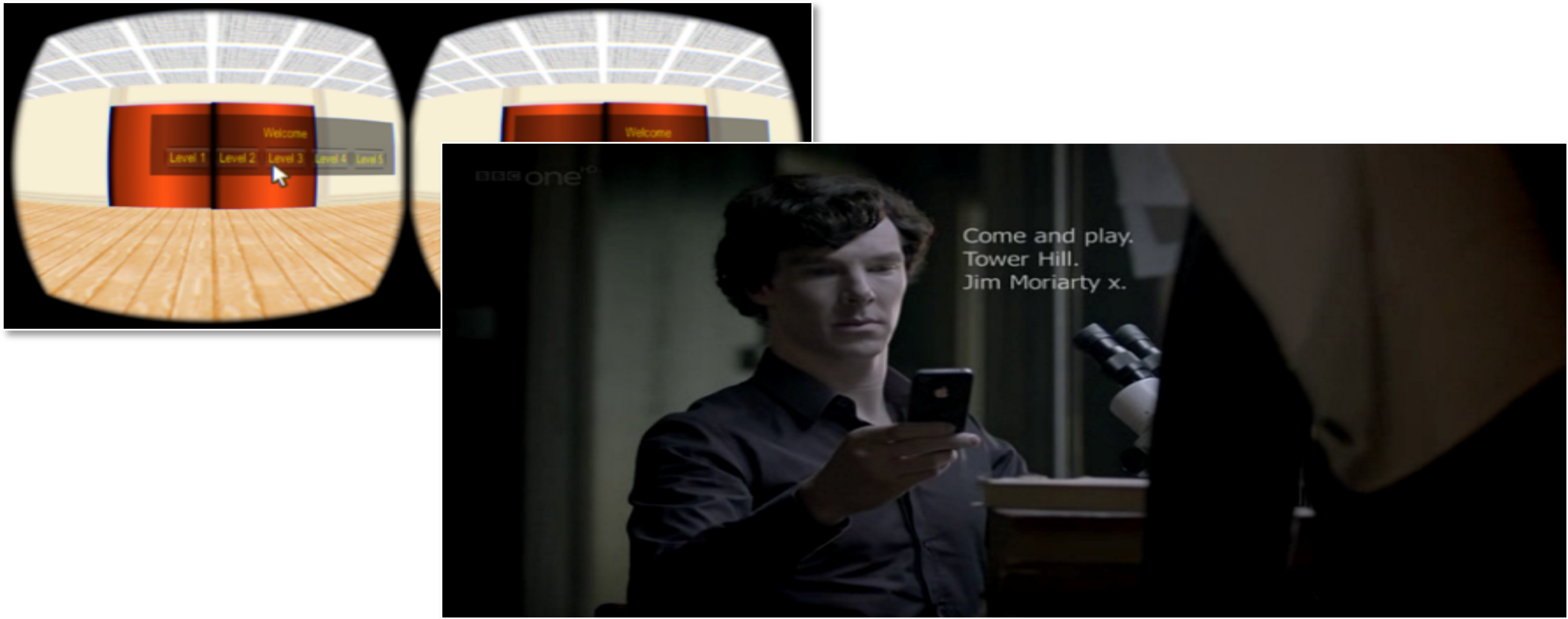
UI elements that derived utility from their relation to the frame of the screen have lost their place.

Don’t pin the UI to the user’s perspective



Team Fortress 2, Valve

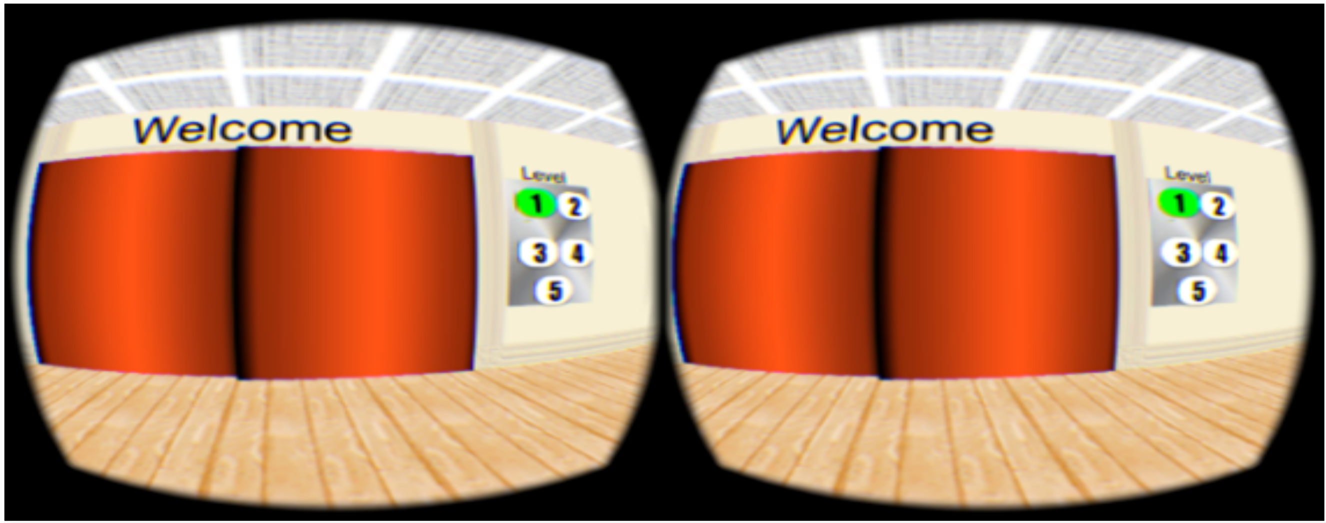
Floating widgets can break immersion



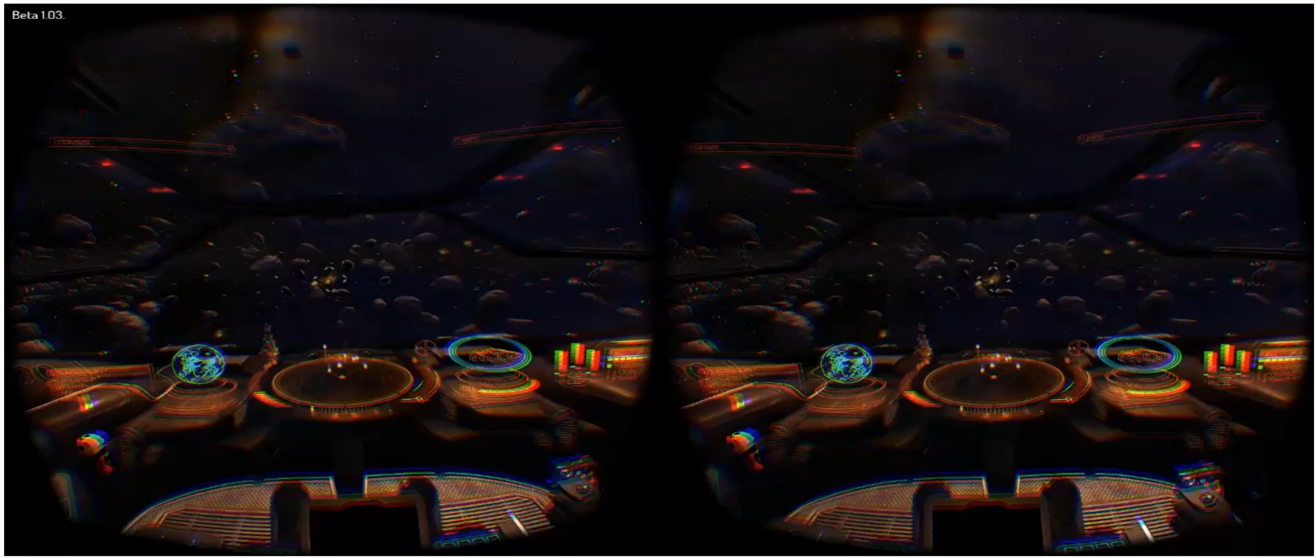
Use “No UI”

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

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



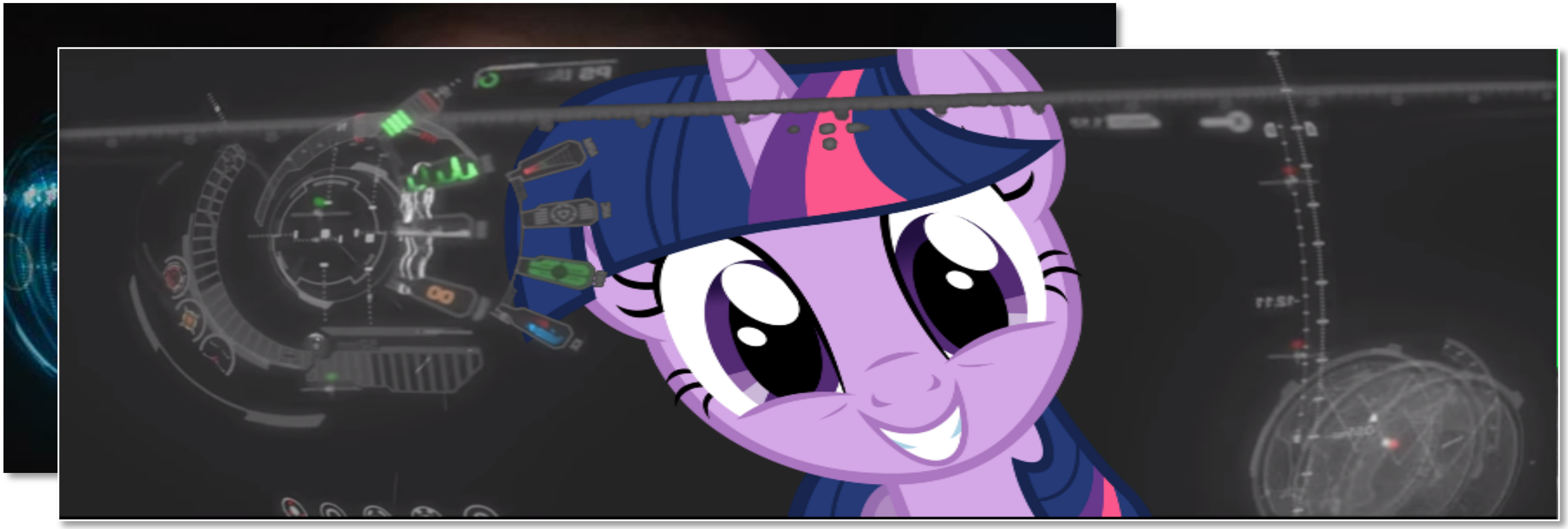
Use “On Demand UI”



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.



Getting user input

- Keyboard and mouse vs. game controller
  Prefer game controller as it is easier to use unseen
- Look based input
  You can use where the user is looking as the "mouse"
- Head gestures
  Use Rift rotational data to detect nods or head shakes
- Additional hardware to get hands in the game
  Leap Motion
  Razer Hydra
  Other hardware that's coming soon (Oculus Touch etc.)

User comfort

- Performance and quality
- Emotional comfort
- Ergonomics
- Motion sickness and cutscenes

Performance and quality

Quality and performance requirements for VR are significantly stricter and higher than for many traditional applications.

Failing to meet these requirements can make your user feel physically ill.

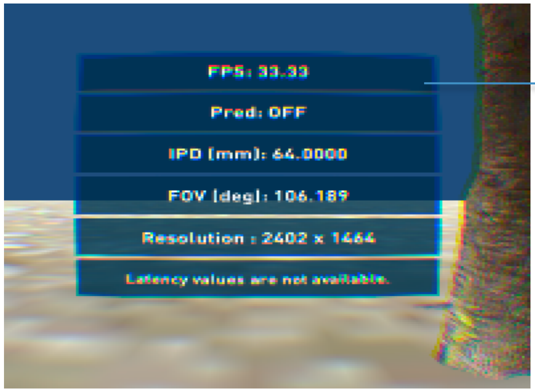
Frame Rates

The frame rate should be equal to or better than the native refresh rate of the Rift display.

- 60 Hz for the DK1
- 75 Hz for the DK2

Finding the FPS

The player prefab from the Oculus Utilities for Unity package contains a menu of diagnostic information you can view by pressing the space bar.



```
FPS: 33.33
Pred: OFF
IPD (mm): 64.0000
FOV (deg): 106.189
Resolution : 2402 x 1464
Latency values are not available.
```

FPS is the top item.

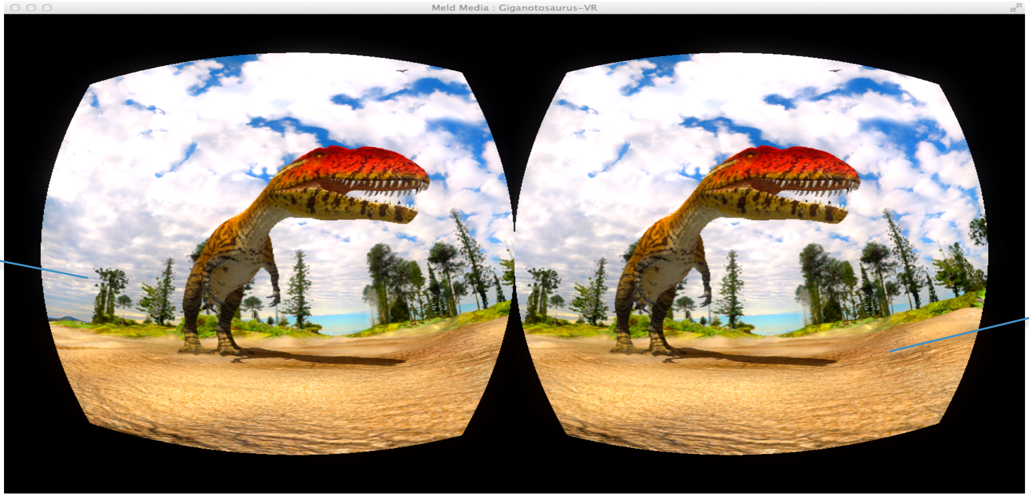
Resolution

The Rift uses stereo rendering, which effectively reduces the horizontal resolution by 50%.

- One way to compensate for the reduced resolution, is to enable or increase anti-aliasing.
- Play close attention to the quality of your graphics.

Consider the emotional impact of VR

VR experiences can be more intense than traditional media.



Cute on screen

Terrifying in VR

GiganotosaurusVR by Meld Media

Ergonomics

Limit causes of eyestrain, neck-strain, and fatigue.

- Make sure all type is easy to read.
- Limit how much and how often the user needs to rotate their head.
- Make it easy for the user to take a break.

Motion sickness

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.

The user is in control of the camera

- The field of view is fixed to that of the Rift.
- 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.)

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, zooms, shakes, etc..

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.

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)

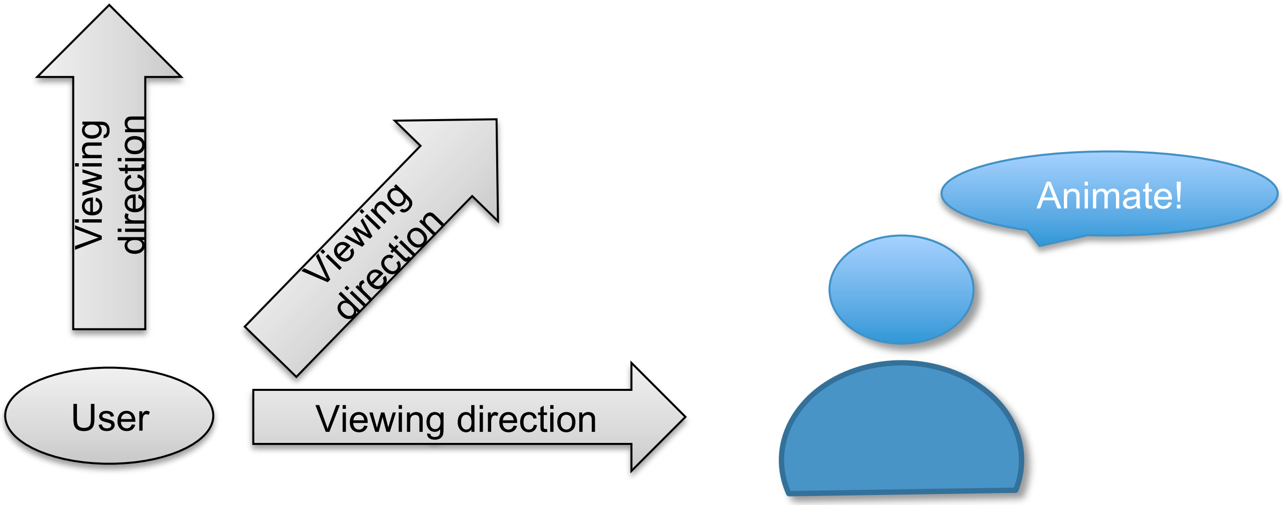
Draw the user's attention

- 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)

Use responsive triggers

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



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

Workshop!

- Unity 5.1 has native VR support for the Rift
- Requires the Oculus 0.7.x runtime (currently only available for Windows)
- Oculus Utilities for Unity package is also useful

Example minimal scene

- Scene should contain: a light, a camera, and some objects to look at.
- Use real-life scale for all objects.
- A first-person player character prefab suitable for VR can be found in the Oculus Utilities for Unity package. This player prefab will require a plane to stand on.

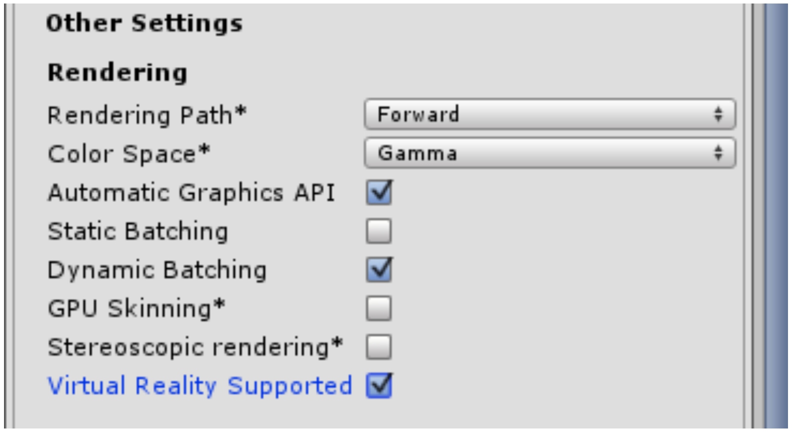
VR project creation

To create a scene that can be run on the Rift:

1. Open an existing 3D project or create a new 3D project.
2. Select **Edit > Project Settings > Player > Other Settings** and make sure that:

   - Virtual Reality Supported is checked

   - Stereoscopic rendering is Unchecked



Other Settings

Rendering

Rendering Path* Forward

Color Space* Gamma

Automatic Graphics API ☑

Static Batching □

Dynamic Batching ☑

GPU Skinning* □

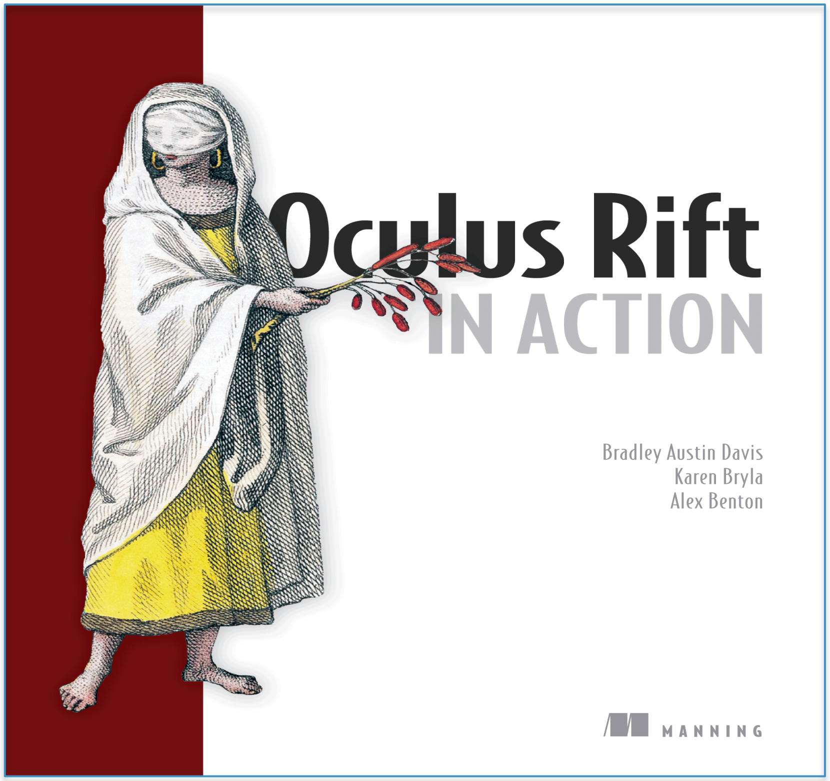
Stereoscopic rendering* □

Virtual Reality Supported ☑

Build and Run

If you build and run your application and find that it isn’t appearing on the Rift, run the application from the command-line with following option:

-vrmode oculus



Available now at:
www.manning.com/bdavis/

Get in touch!
karen@karenbryla.com
rifty-business.blogspot.com
github.com/
OculusRiftInAction