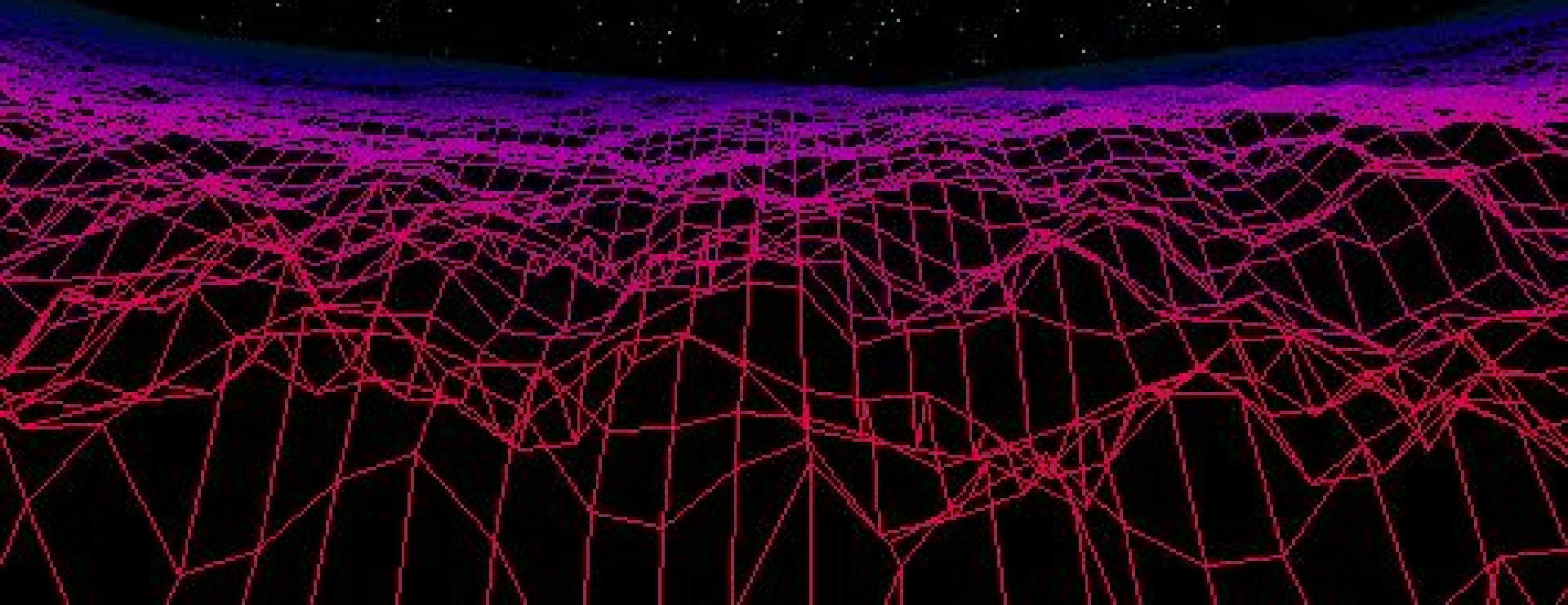


Migrating Web apps to Virtual Reality



denis.radin@gmail.com

@PixelsCommander



LIBERTY GLOBAL



TV STB Operating system, 500 000 lines of
JavaScript

**This is not just
about TVs**

working in Entertainment
department



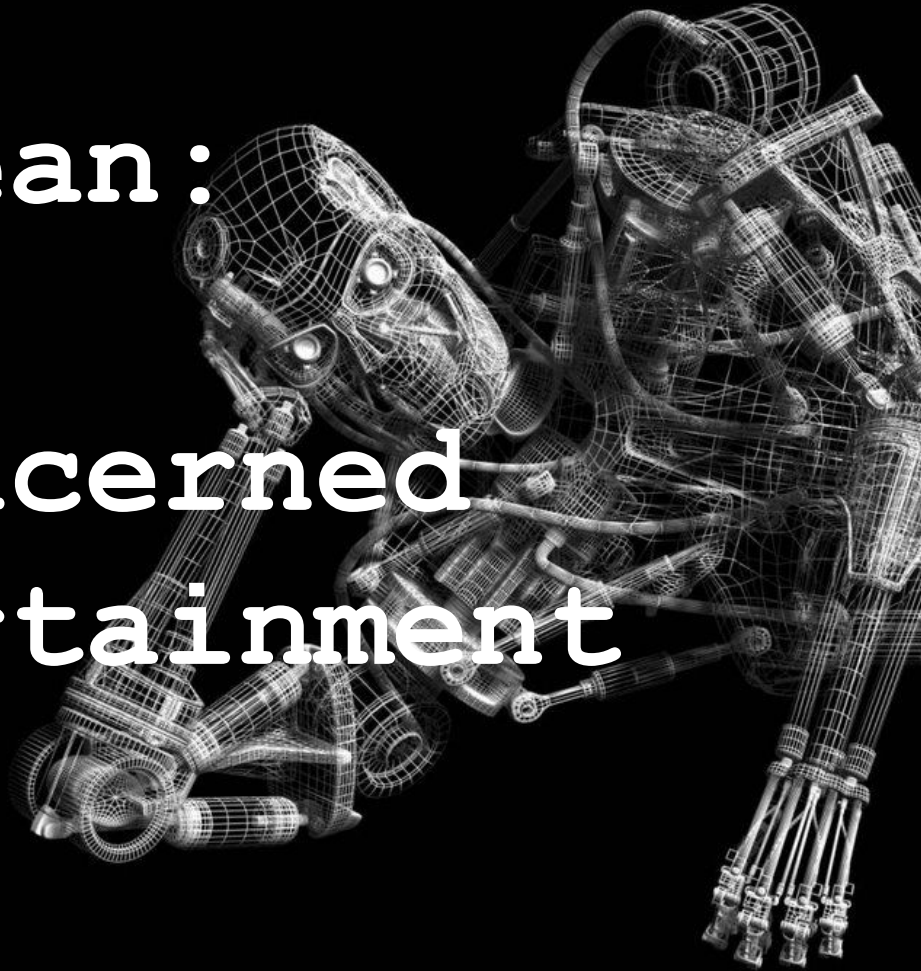


Porn drives the world

And VR porn is coming

Sorry, I mean:

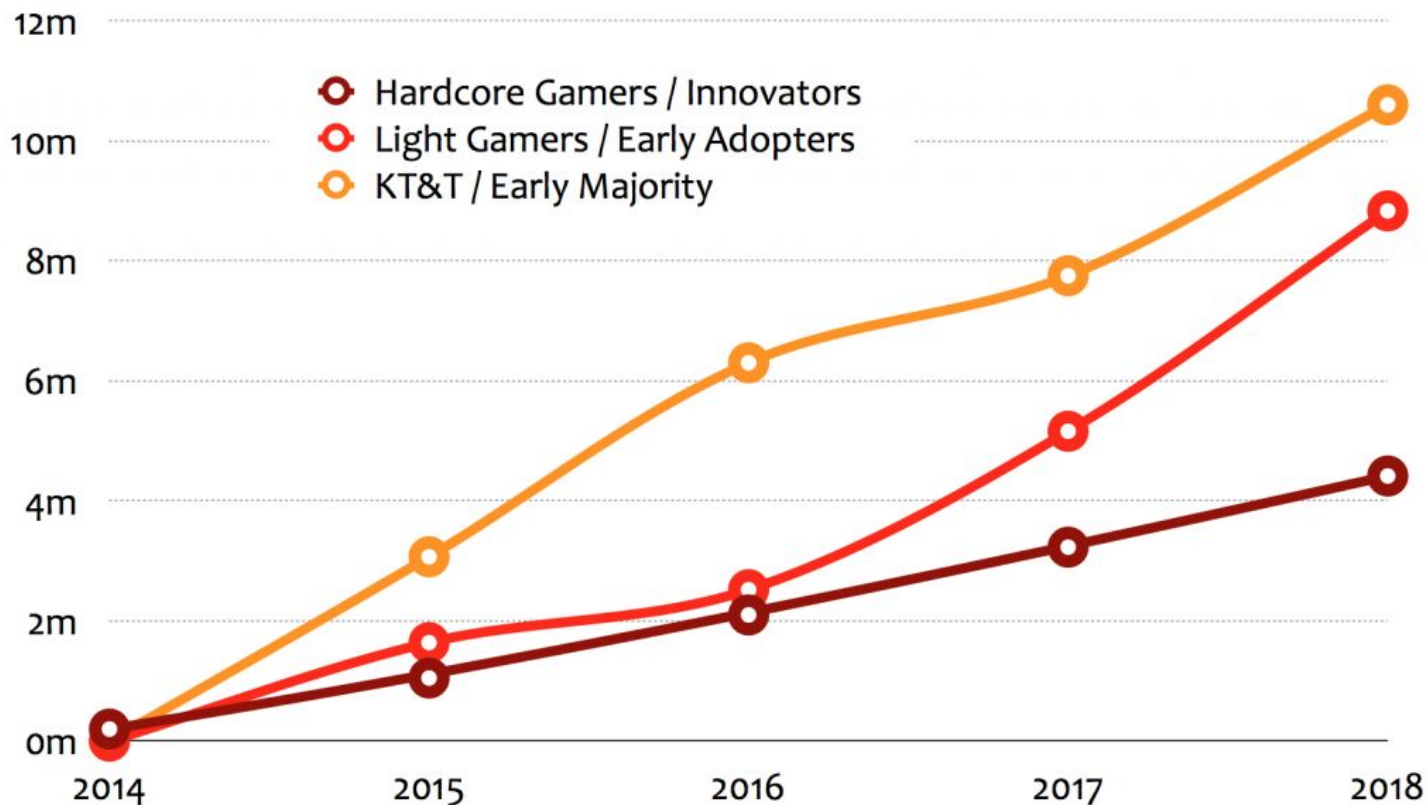
"We are concerned
about entertainment
trends"







Annual Unit Sales for Consumer Virtual Reality Devices





Why drop web apps
to VR?

The background of the slide is a dark, textured surface composed of a complex, interconnected network of thin, light-colored lines. These lines form a series of peaks and valleys, creating a three-dimensional, wireframe-like effect that resembles a stylized landscape or a topographical map. The overall aesthetic is modern and technical.

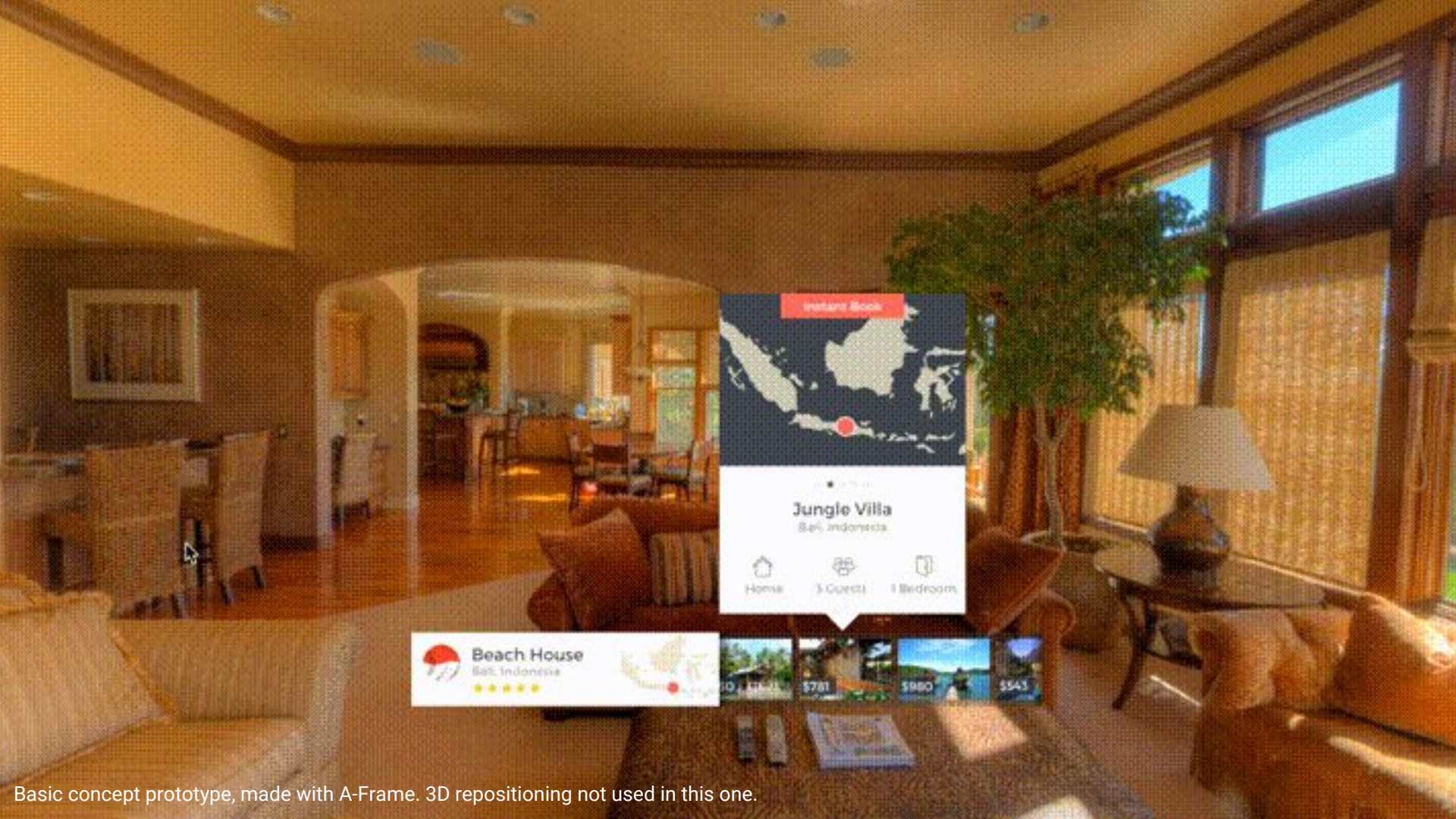
Example

You made a car
customization
web app



Example

You made a real
estate catalog
as a web app



Instant Book



Jungle Villa
Bali, Indonesia

Home 3 Guests 1 Bedroom

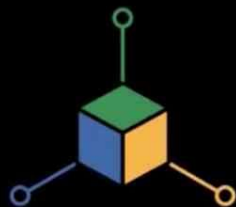
 **Beach House**
Bali, Indonesia
★★★★★



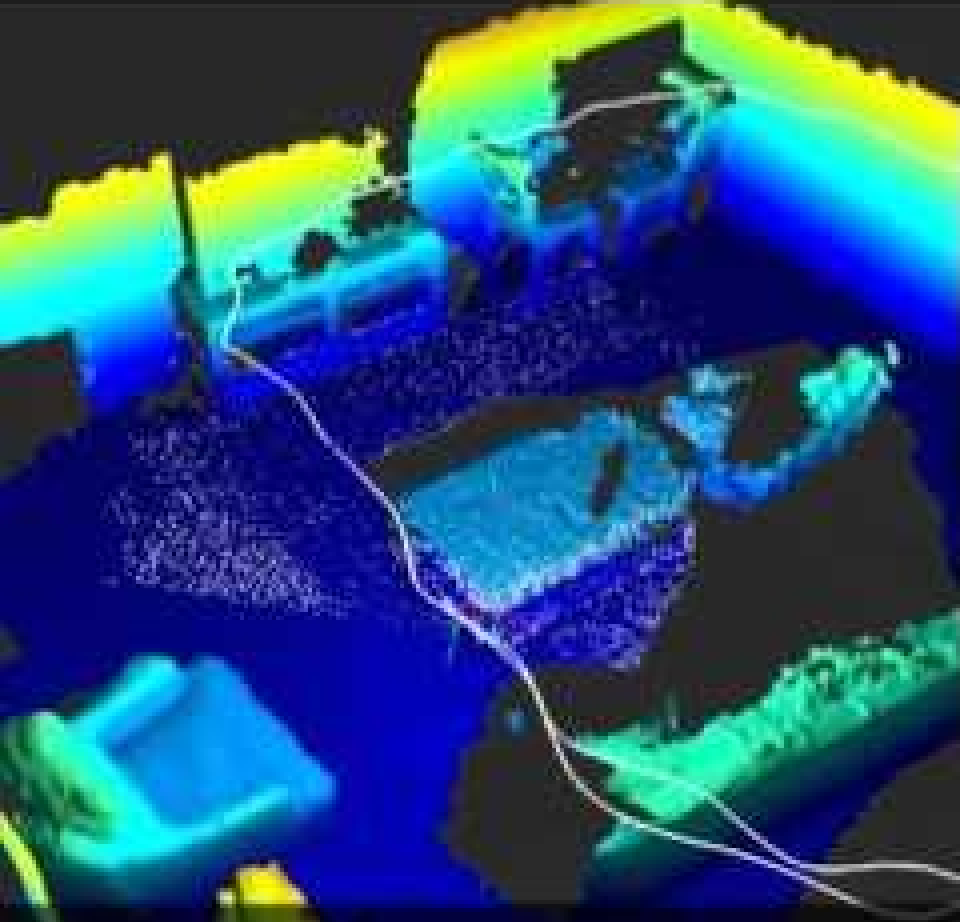
 \$761	 \$980	 \$543
---	--	--

Basic concept prototype, made with A-Frame. 3D repositioning not used in this one.

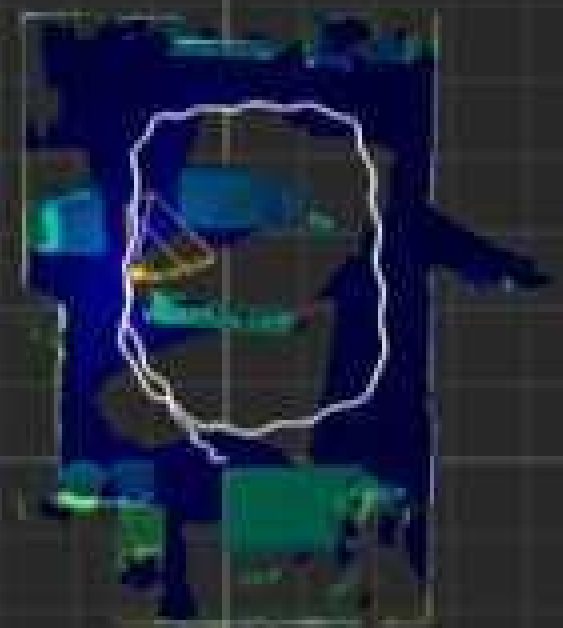
Nice to know about
real estate 3d
revolution:



Project Tango



Tracking & Realtime Geometry Reconstruction
of a Small Apartment (1000 sqft)



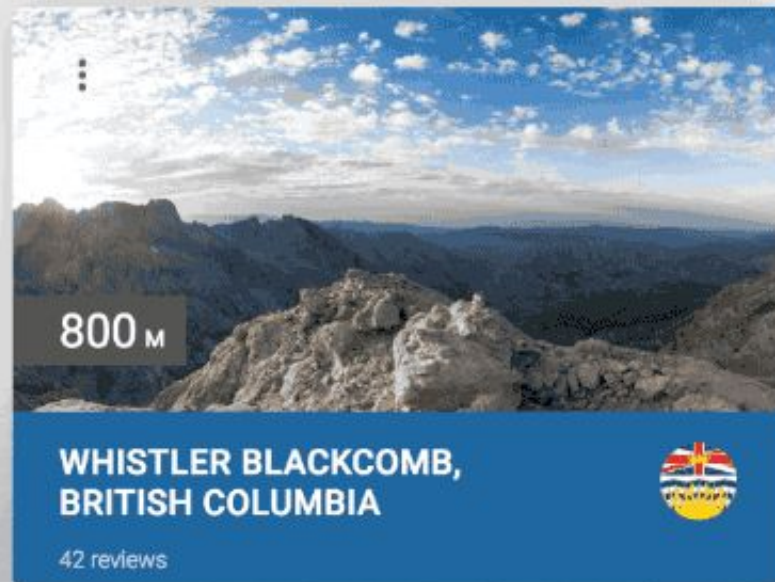
Both images show raw point cloud readings



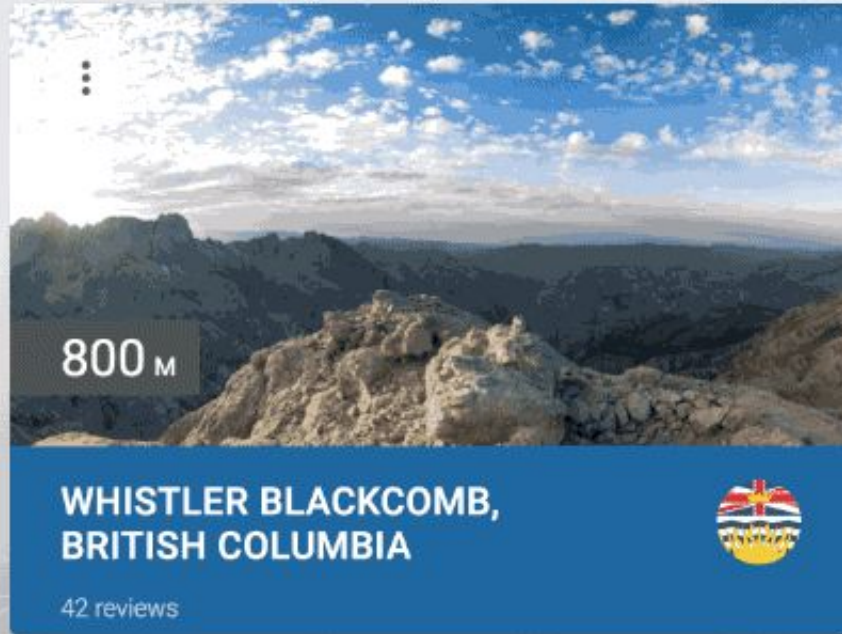
So...

Virtual Reality
provides new
experiences for
customers

Not just a flat
picture

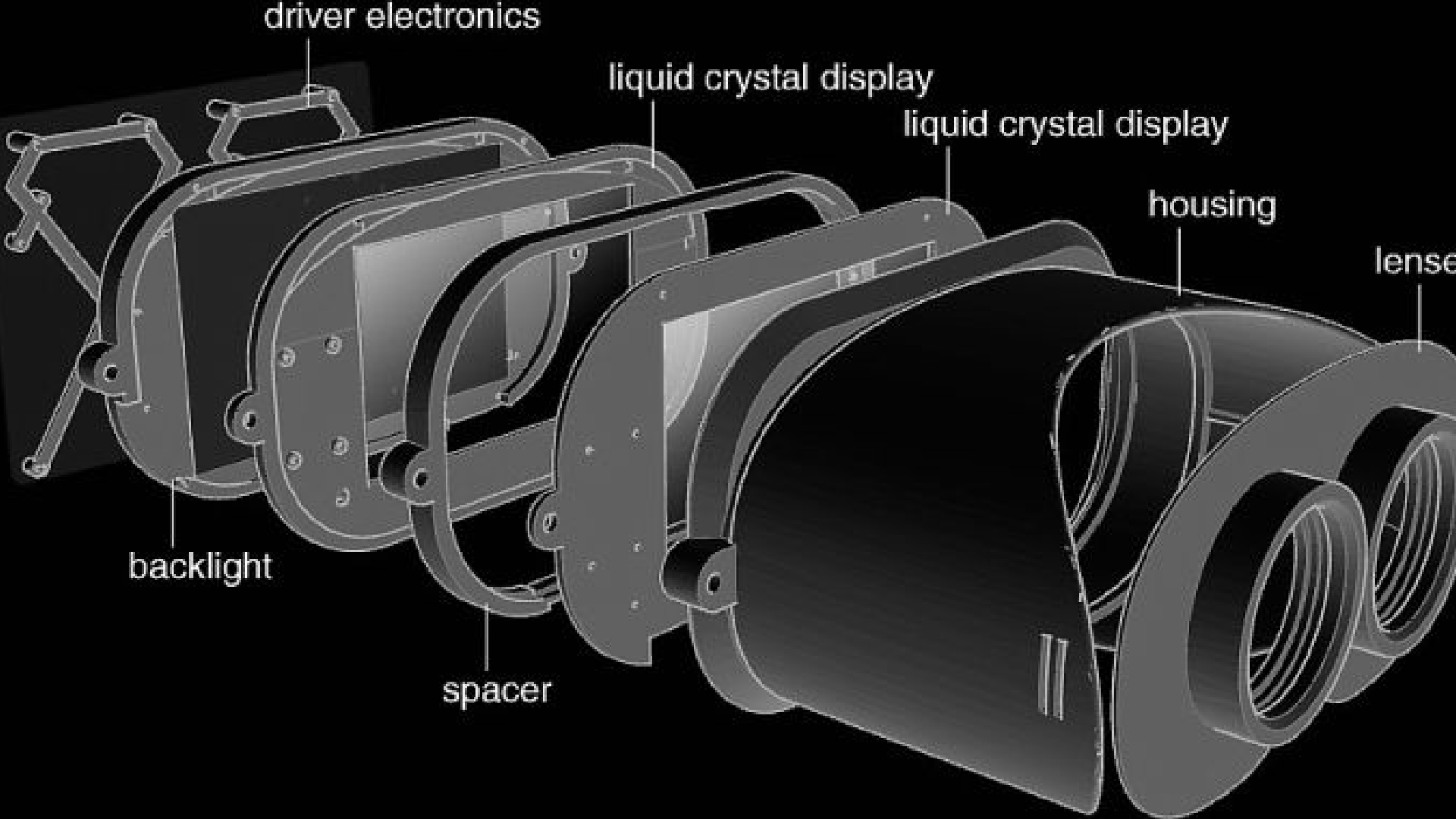


Your site just works, “for free”. But the site is stuck inside a small window. Developers should be able to fill the entire 360 environment.



What if developers could, with CSS: apply a 360 background, make the window transparent, and re-position elements in 3D space?

How VR works?



STORE

All

Samsung

HEROBOUND
FIRST STEPS

Hero Bound



360 Photos



Cinema



Platform VR



The Room



360 Videos

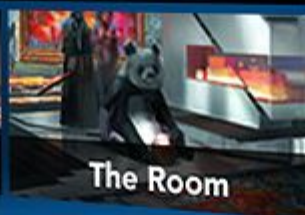
STORE

All

Samsung

HEROBOUND
FIRST STEPS

Hero Bound



360

3

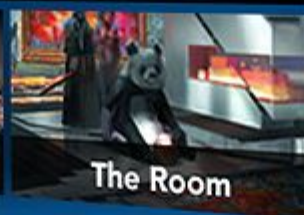
STORE

All

Samsung

HEROBOUND
FIRST STEPS

Hero Bound



360 P

360 V

VR DEV: Good parts



VR DEV: Bad parts

UNITY

```
GameObject canvasGO = new GameObject();  
RectTransform canvasRT =  
canvasGO.AddComponent<RectTransform>();  
Canvas canvasCV = canvasGO.AddComponent<Canvas>();  
canvasCV.RenderMode = RenderMode.ScreenSpaceCamera;  
Vector3 pos = Camera.main.transform.position;  
pos += Camera.main.transform.forward * 10.0f;  
canvasCV.worldCamera = Camera.main;
```

```
GameObject buttonGO = new GameObject();  
RectTransform buttonRT =  
buttonGO.AddComponent<RectTransform>();  
buttonRT.SetParent(canvasRT);  
buttonRT.sizeDelta = new Vector2(200.0f, 100.0f);  
Button buttonBU = buttonGO.AddComponent<Button>();  
buttonBU.onClick.AddListener( () => {
```

Three.js

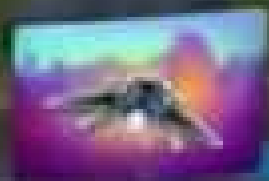
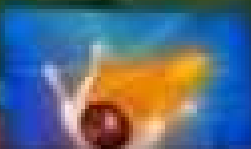
```
var gui = new THREE.SimpleDatGui();  
gui.add(myFunctions, 'RESET_EVENT').name('Reset  
Position');  
gui.add(gui_options,  
'CONNECT_TO_OCULUS_RIFT').name('Oculus  
Control').onChange(function(value) {  
    oculusRiftControl.setActive(value);  
});  
gui.add(gui_options,  
'TRANSPARENT').name('Tranparent').onChange(function(  
value) {  
    gui_options.OPACITY = (value) ? 80 : 100;  
});  
gui.add(gui_options, 'OPACITY', 10,  
100).step(10).name('Opacity').onChange(function(val  
ue) {  
    gui_options.TRANSPARENT = !(value == 100);
```

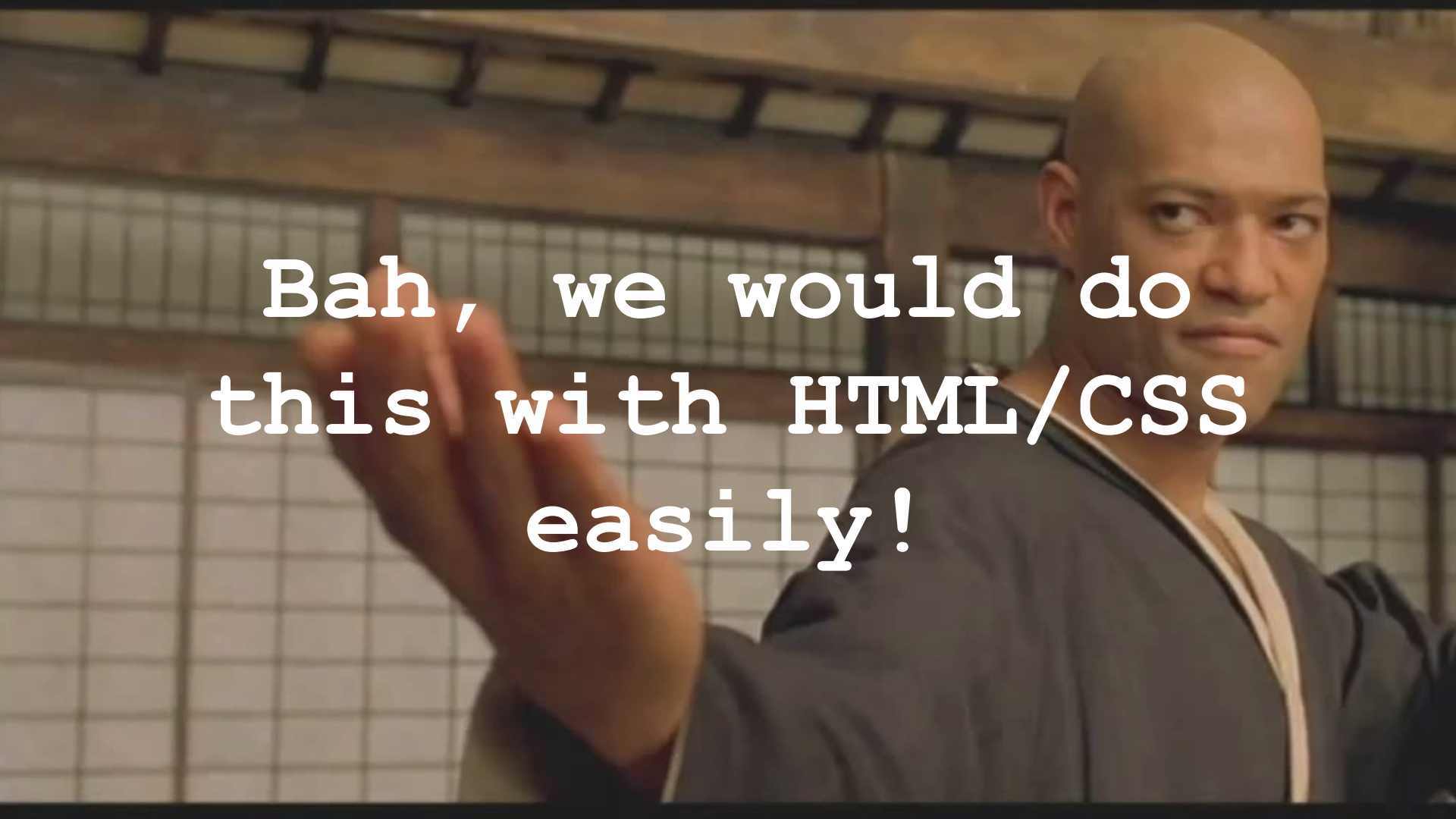
Step backward
for front-end
ninjas

SAD NINJA







A still from the movie 'The Happening' featuring M. Night Shyamalan. He is bald, wearing a dark blue martial arts gi with a white stripe on the sleeve, and is in a defensive pose with his right hand raised. The background is a traditional Japanese building with a tiled roof and a sliding door (shoji).

Bah, we would do
this with HTML/CSS
easily!



How?

- Would CSS 3D work for porting my Web app to VR?

Kinda we can display
HTML content in VR
for free

[Demo](#), [Demo2](#)



2 eyes, 2 iframes

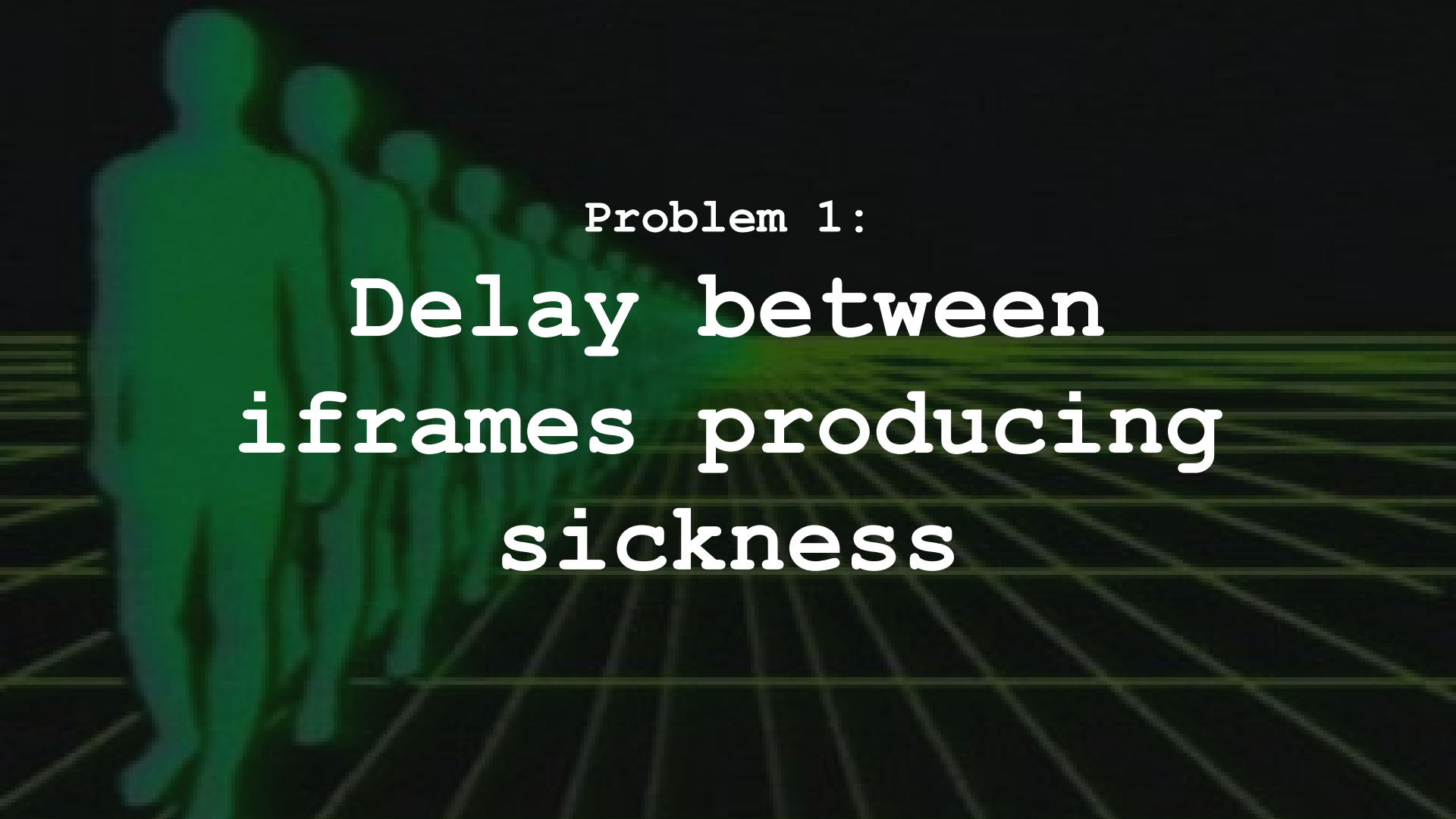


×

CLOSE

– Would CSS 3D work
for porting my Web
app to VR?

– No

The background of the slide features a series of green silhouettes of human figures walking away from the viewer into the distance. They are positioned on a dark floor with a grid of light-colored lines that recede into the background, creating a strong sense of perspective. The overall color palette is dark with green highlights.

Problem 1:

Delay between
iframes producing
sickness



2 eyes, 2 instances

= delay

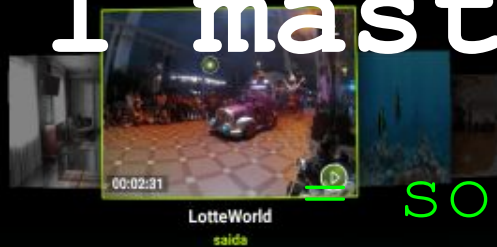


×

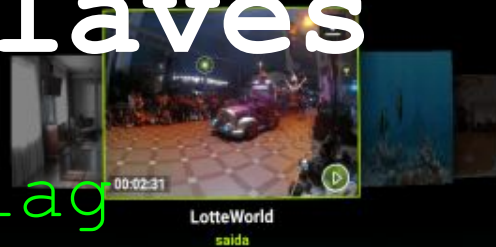
CLOSE



1 master, 2 slaves

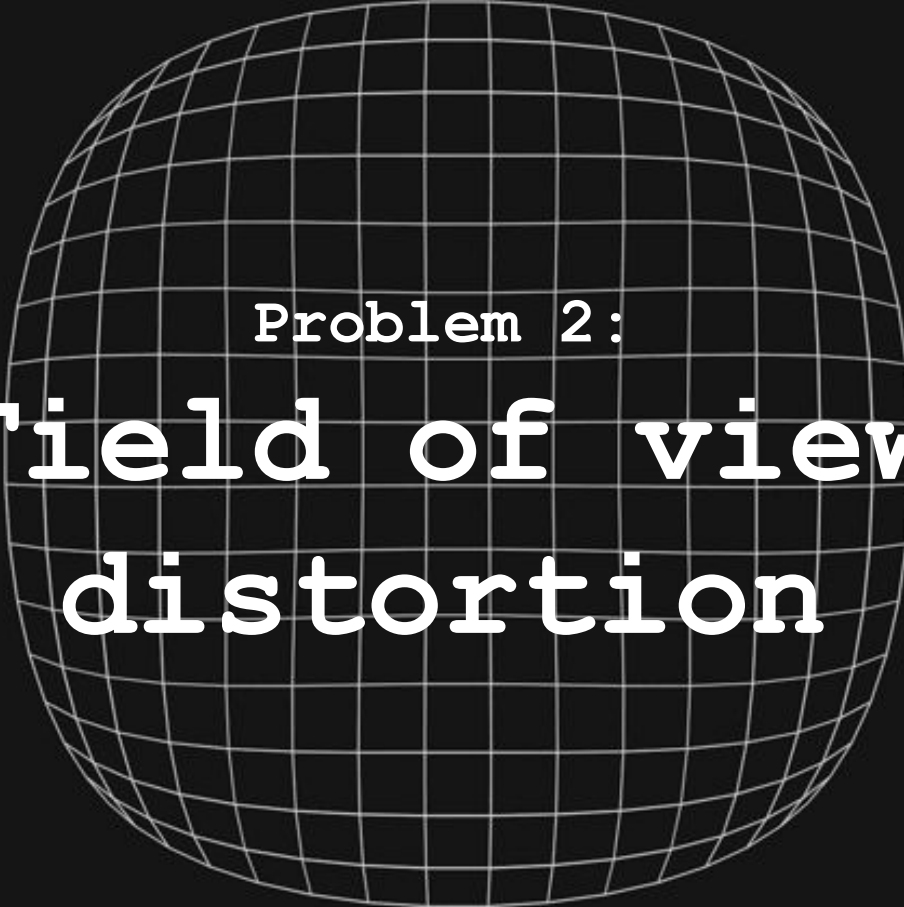


solution, no lag



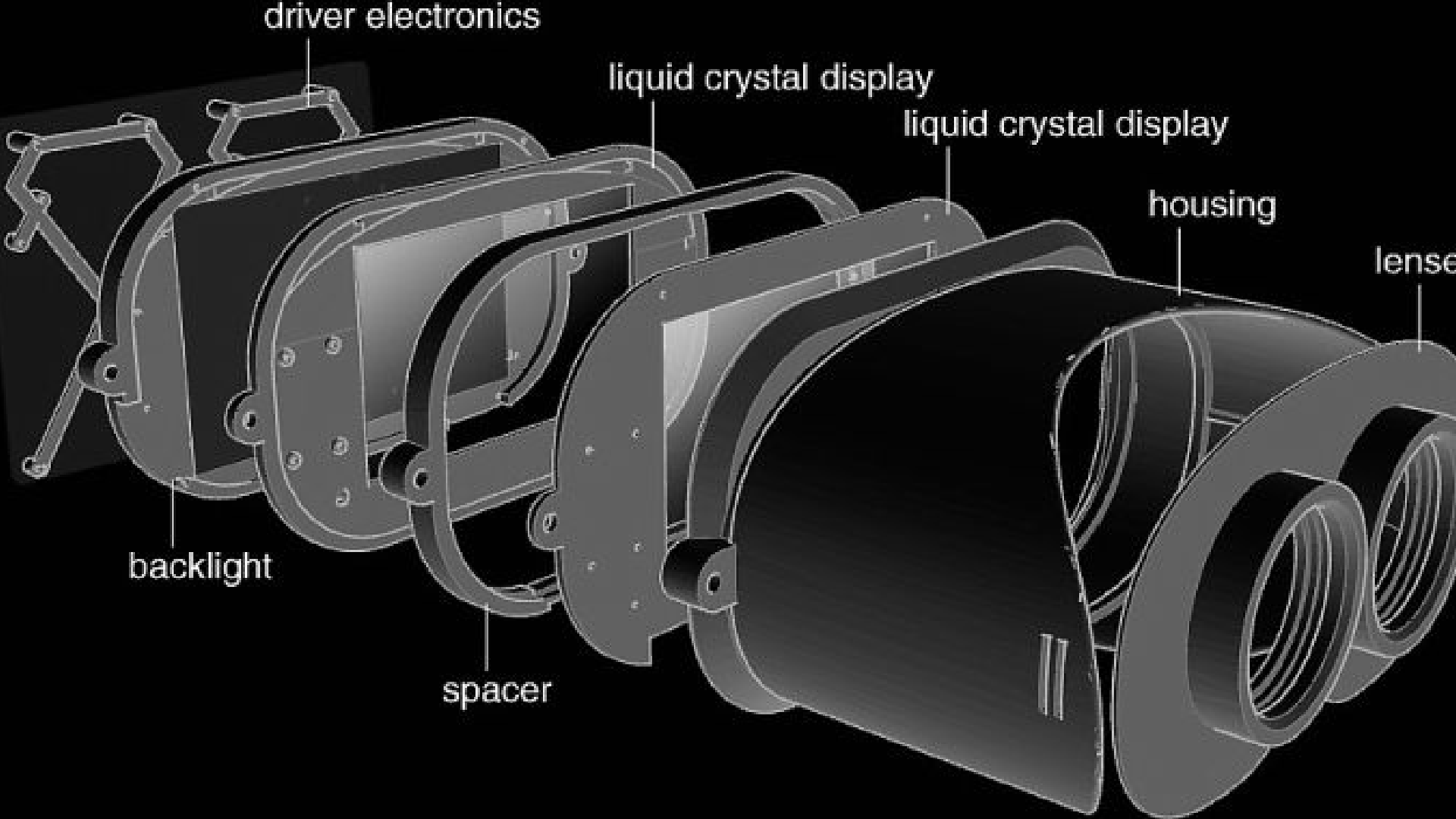
×

CLOSE

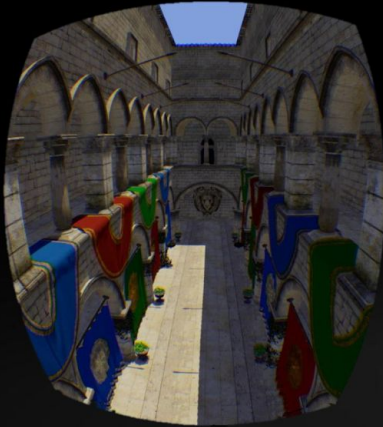


Problem 2:

Field of view distortion

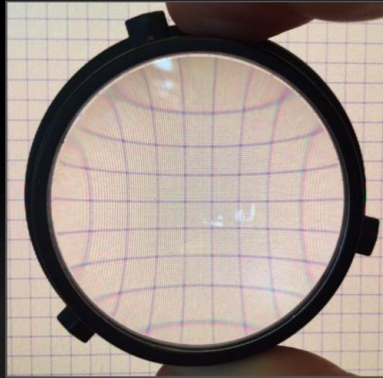


Field of view enhancement



LCD Display

Warped “fisheye”-like image required to match optics - enlarged in the center and compressed in the periphery



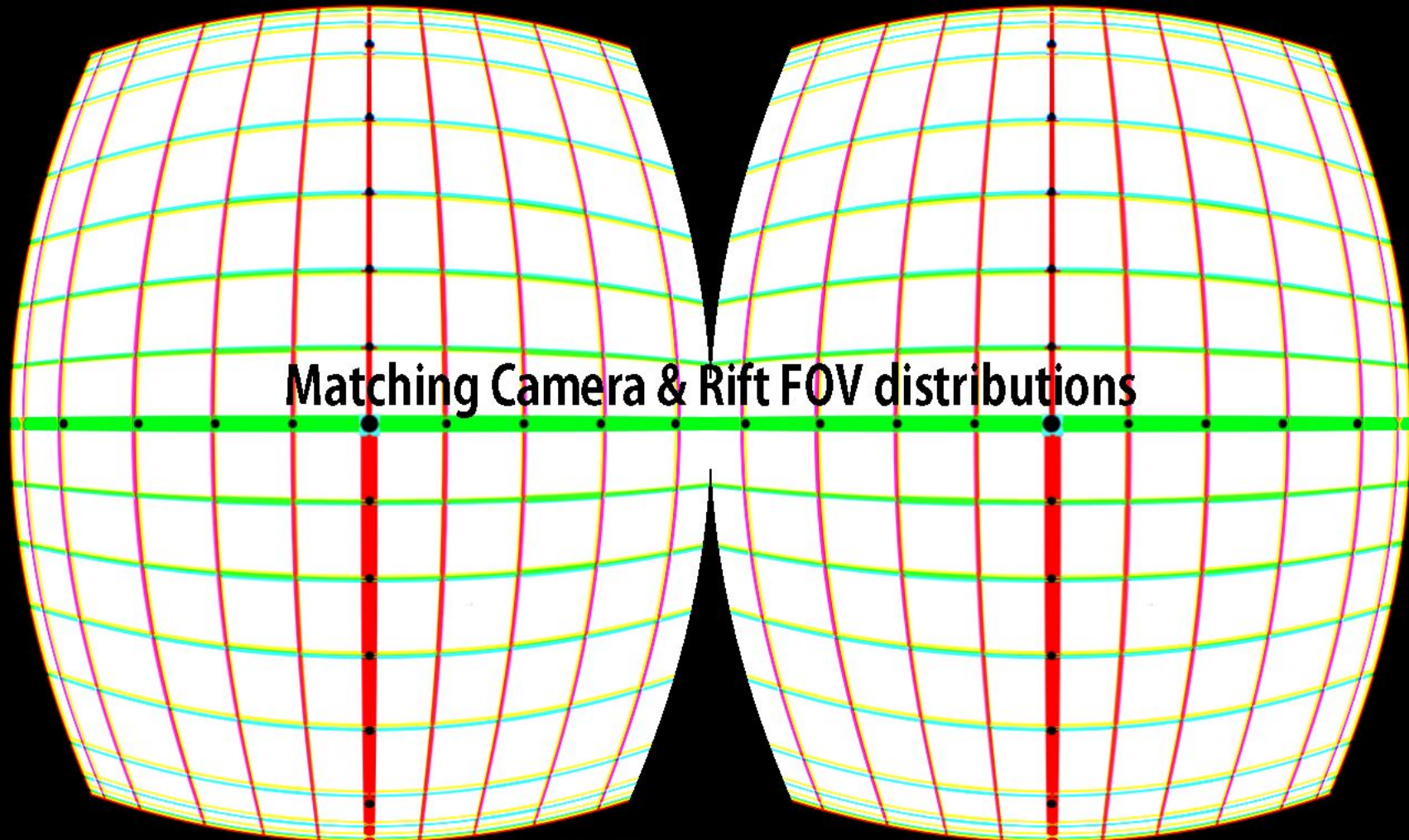
Optics

Transforms light from display to a wide field of view focused on the eye



User's view

User sees correctly proportioned (not fisheye) scene with wide field of view



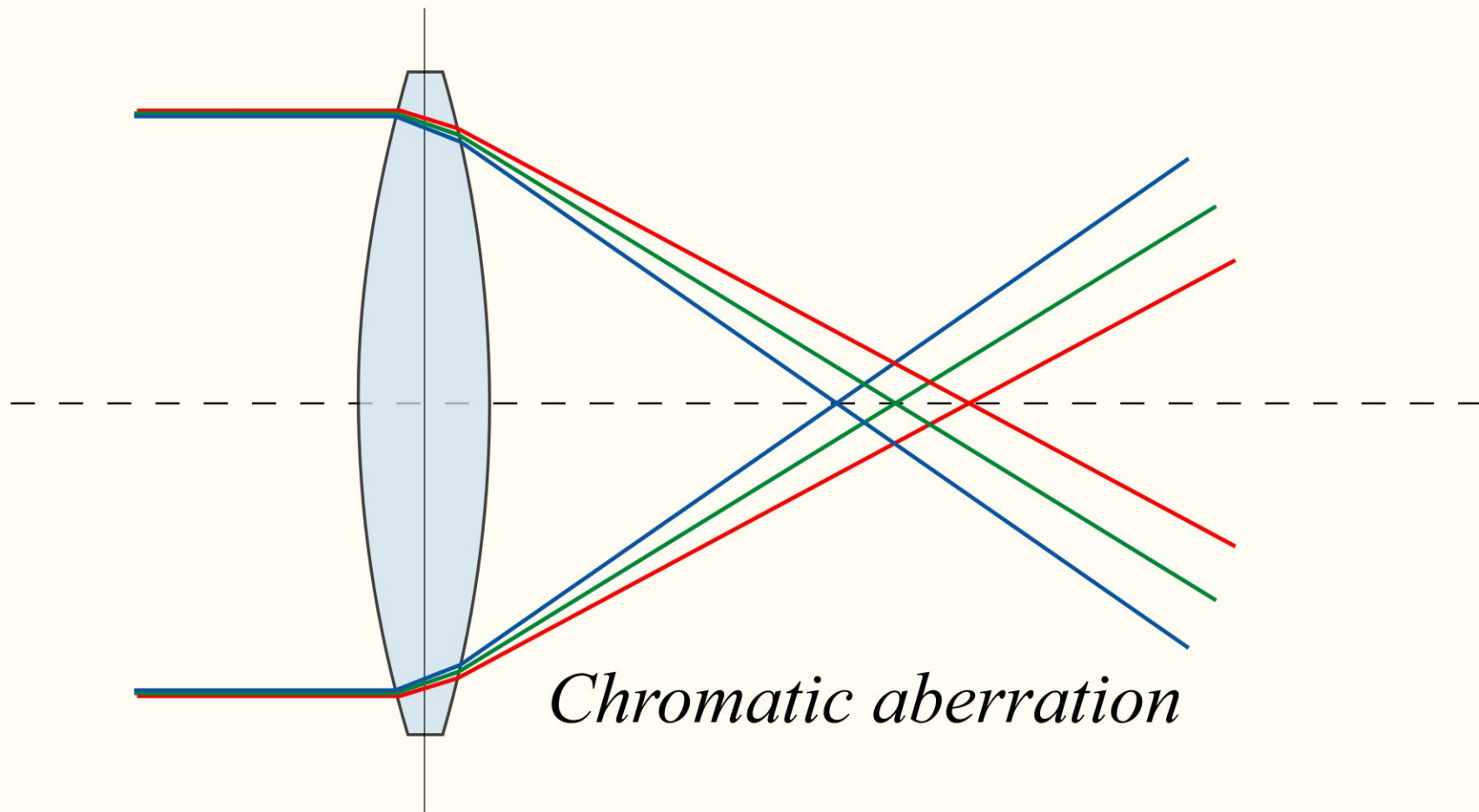
Matching Camera & Rift FOV distributions

Camera FOV is grid, Rift FOV shown by black points, 10° spacing

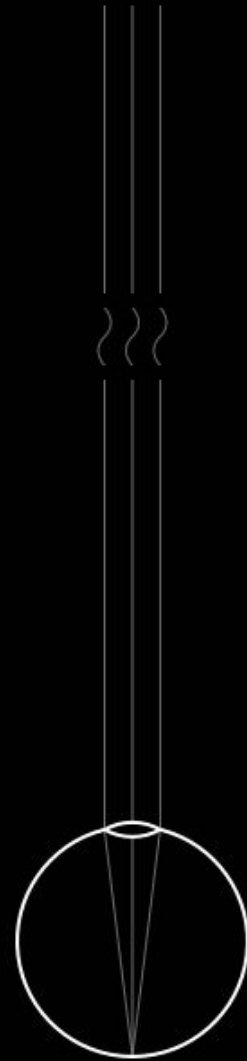
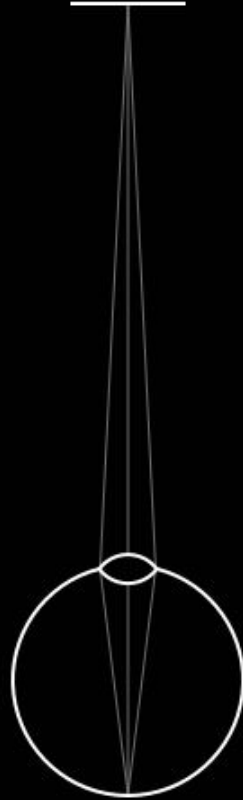
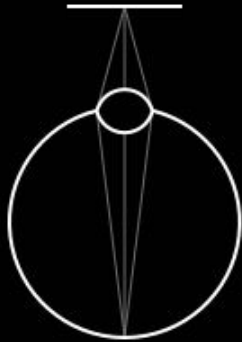
The background is a dark, textured surface with a grid of thin, glowing lines in blue, green, and red. Overlaid on this are numerous bright, multi-colored light streaks and starburst patterns, resembling light trails or reflections on a polished surface. The colors are primarily blue, green, and red, with some yellow and white highlights.

Problem 3:

Chromatic aberration



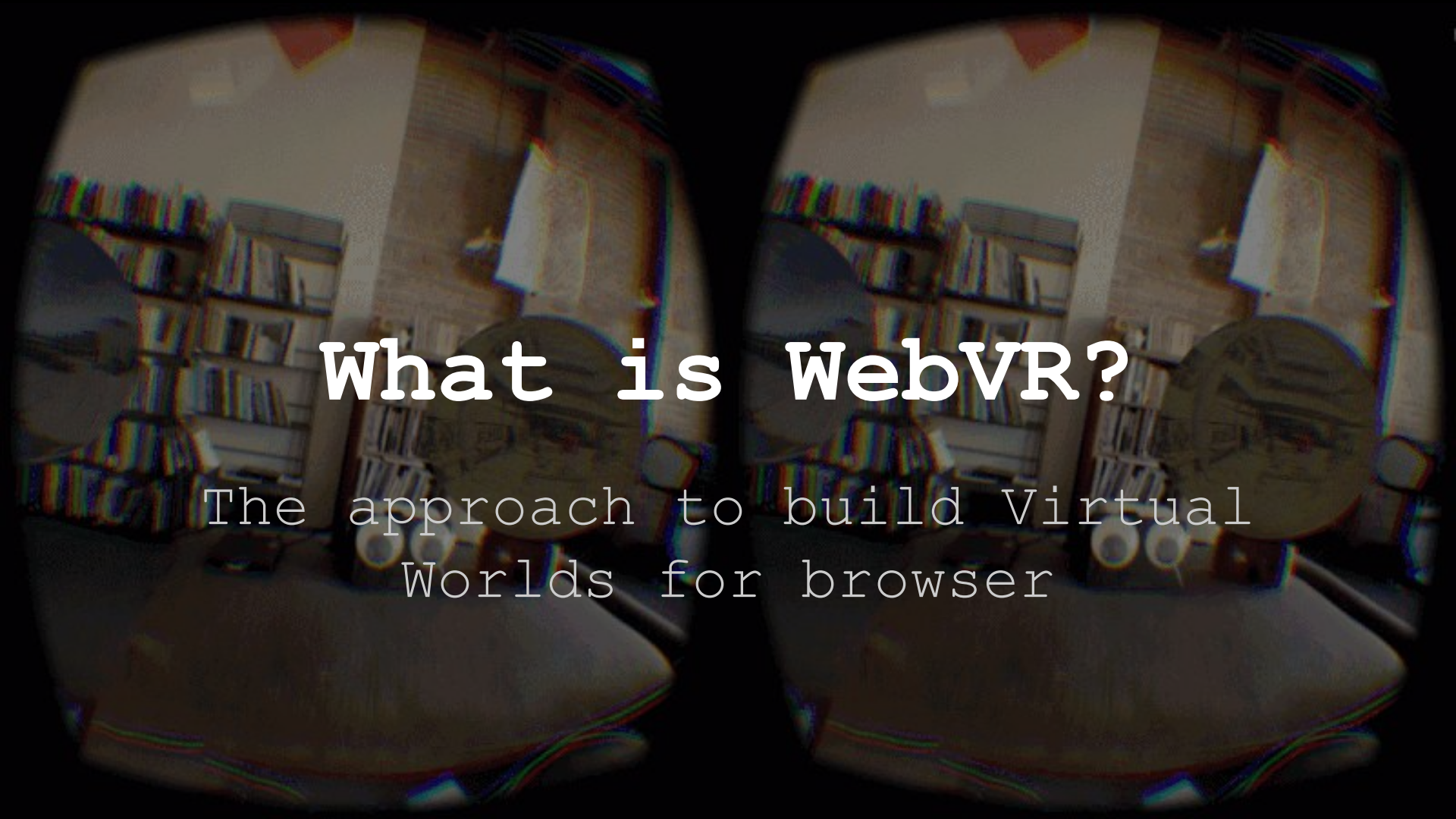
Making it distanced





**Sorry, no CSS3D,
seriously**

We need shaders to apply
FOV transformation
and chromatic aberration

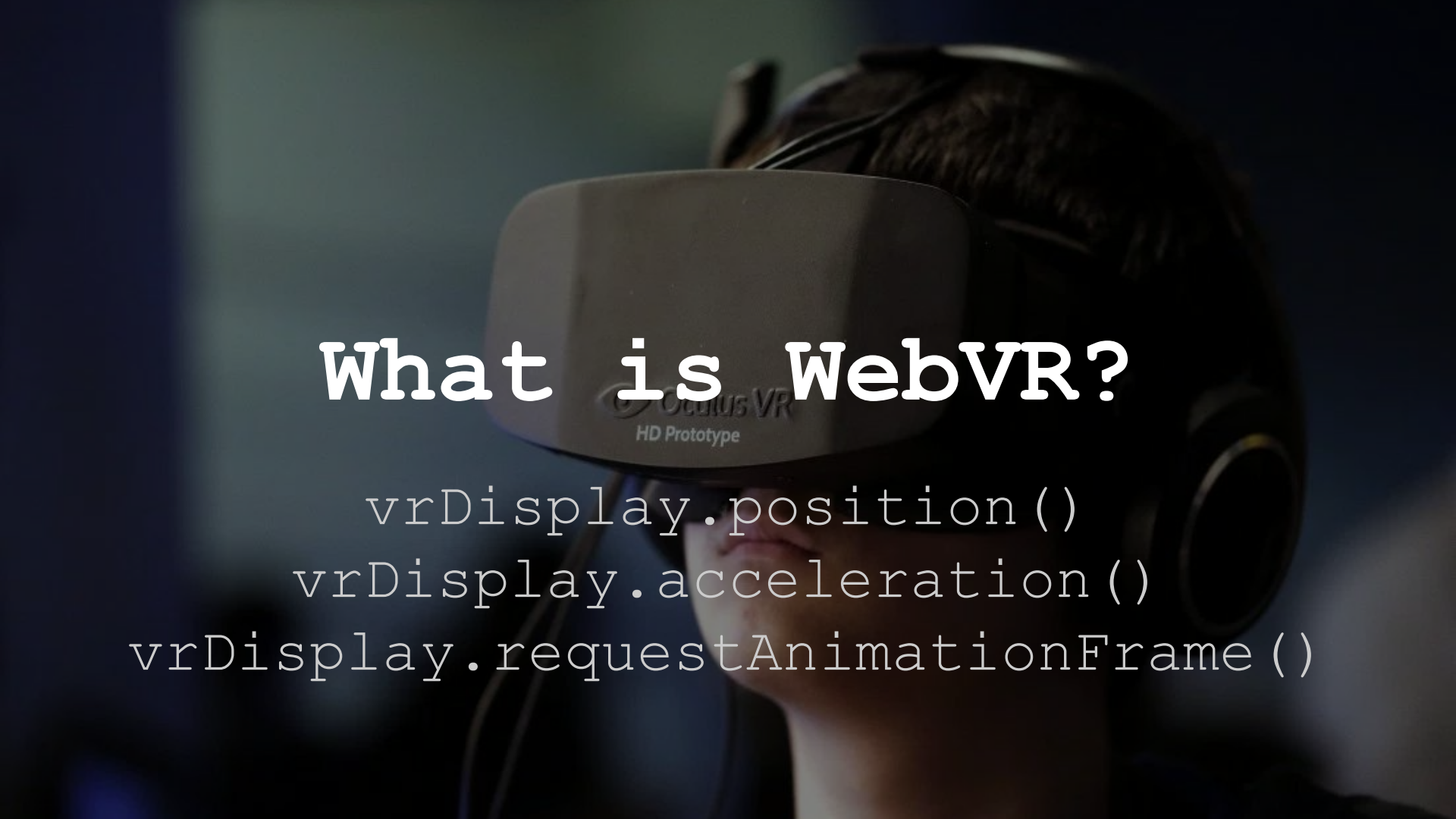
The background of the slide is a stereoscopic VR view of a virtual library. It shows two identical side-by-side images of a room with bookshelves filled with books, a desk with a lamp, and a chair. The text is overlaid on this image.

What is WebVR?

The approach to build Virtual
Worlds for browser

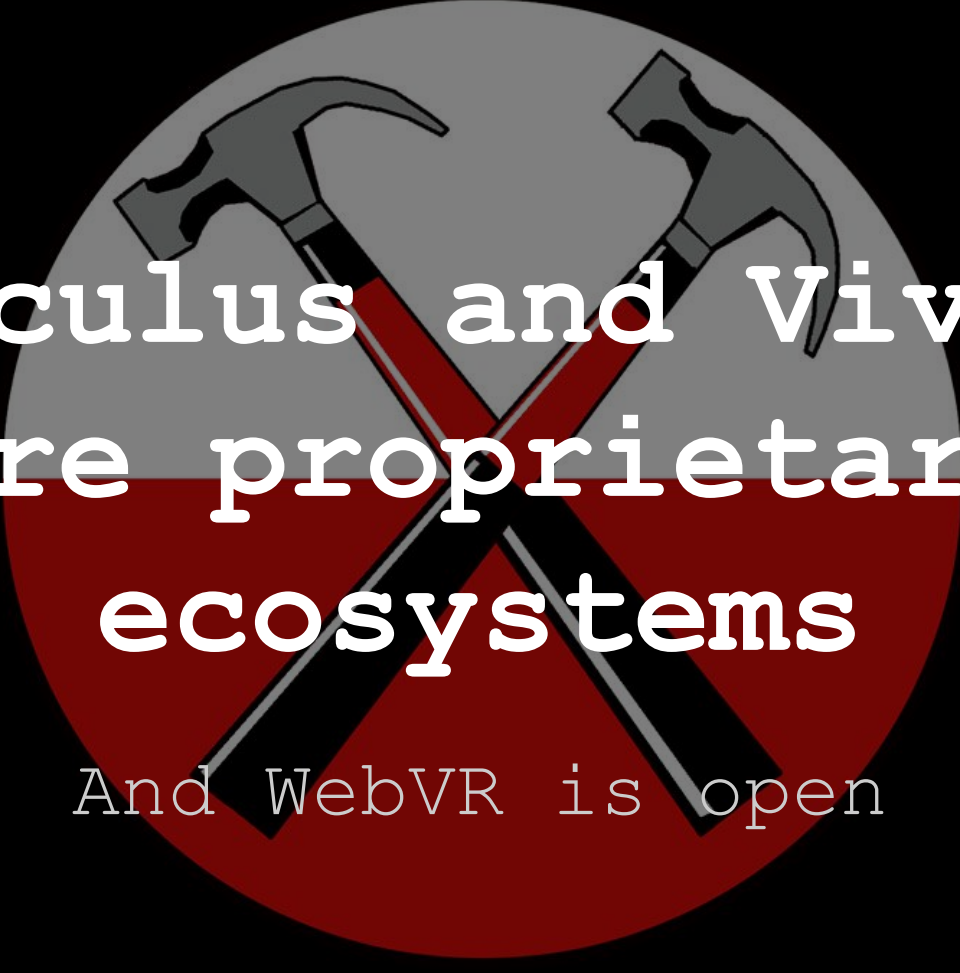
What is WebVR?

Family of APIs: WebGL +
VR Sensors + Gamepad API +
Helmet detection API

A person is wearing an Oculus VR HD Prototype headset. The headset is black with a white front panel. The text "Oculus VR" and "HD Prototype" are visible on the front panel. The person's face is partially visible through the headset's lenses. The background is dark and out of focus.

What is WebVR?

```
vrDisplay.position()  
vrDisplay.acceleration()  
vrDisplay.requestAnimationFrame()
```



Oculus and Vive
are proprietary
ecosystems

And WebVR is open

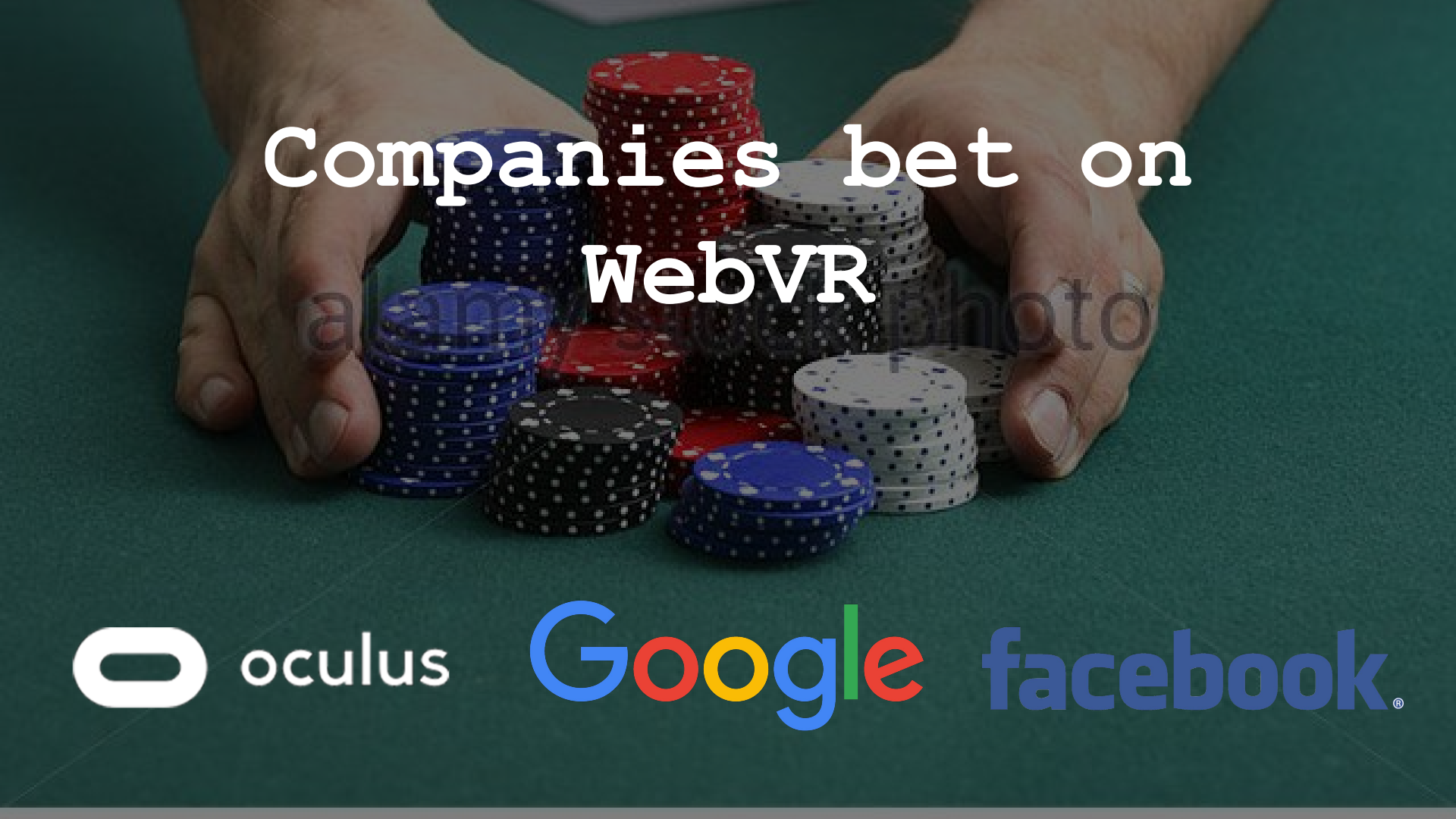
WebVR support





WebVR is instant

No need to download something

A background image showing a pair of hands on a green felt surface, surrounded by several stacks of poker chips in blue, red, black, and white. The text 'Companies bet on WebVR' is overlaid in white.

Companies bet on WebVR



oculus



facebook®



WebVR mostly uses Three.js

ThreeVR, ThreeVREffect plugins

WebVR: Bad parts

HTML

```

```

WebVR (three.js)

```
var renderer = new THREE.WebGLRenderer();  
renderer.setSize(window.innerWidth,  
window.innerHeight);  
document.body.appendChild(renderer.domElement);  
  
var camera = new THREE.PerspectiveCamera(45,  
window.innerWidth / window.innerHeight, 1, 1000);  
  
camera.position.z = 500;  
  
var scene = new THREE.Scene();  
  
var material = new THREE.MeshLambertMaterial({  
    map:  
    THREE.ImageUtils.loadTexture('http://www.html5canva  
stutorials.com/demos/assets/crate.jpg')});  
  
var plain = new THREE.Mesh(new THREE.Plain(200,  
200), material);  
  
scene.add(plain);
```



Wait a minute...



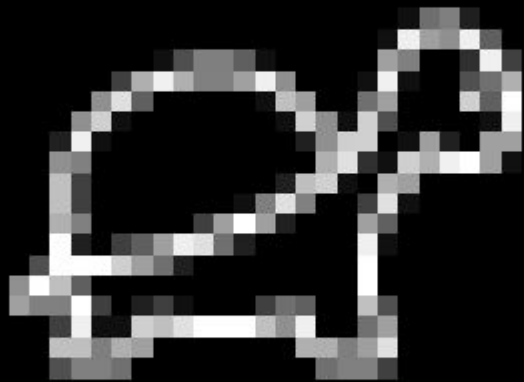
500 000 lines of code JavaScript OS
iPhone 2g, 512 RAM

ChallengingNative.com

Fast web applications development, profiling and optimization



CPU



GPU





CPU



GPU



Modern GPU can
handle 100 000 000
of textured surfaces

May treat this as
"100 000 000 of animated
HTML elements"



Why so many?

For some 3d things it is still
not enough of details

OpenGL is also
available on the Web
via WebGL

Let`s release bunnies!

A wireframe 3D rendering of a landscape. In the foreground, there's a grid floor. In the background, there's a large, multi-tiered tree-like structure on the right and a smaller, more complex structure on the left. A small robot-like figure is visible in the middle ground.

Why do not we use WebGL for content?

Imperative, verbose, no layout

WebGL: Bad parts

HTML

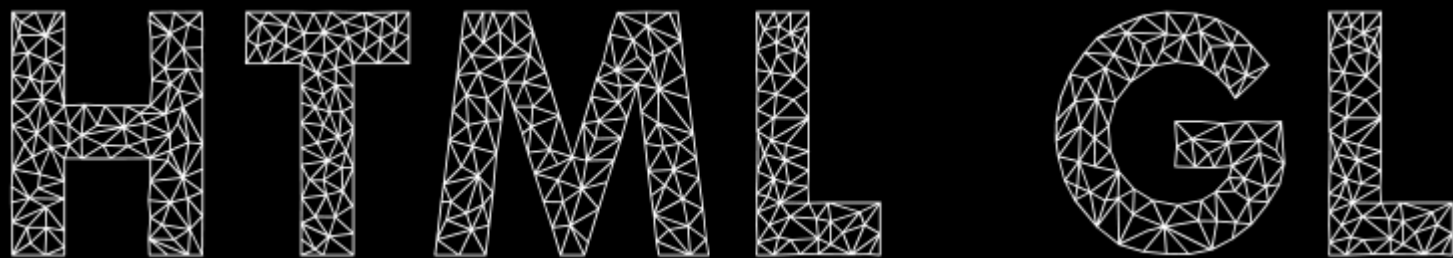
```

```

WebGL (three.js)

```
var renderer = new THREE.WebGLRenderer();  
renderer.setSize(window.innerWidth,  
window.innerHeight);  
document.body.appendChild(renderer.domElement);  
var camera = new THREE.PerspectiveCamera(45,  
window.innerWidth / window.innerHeight, 1, 1000);  
camera.position.z = 500;  
var scene = new THREE.Scene();  
var material = new THREE.MeshLambertMaterial({  
  map:  
    THREE.ImageUtils.loadTexture('http://www.html5canva  
stutorials.com/demos/assets/crate.jpg')});  
var plain = new THREE.Mesh(new THREE.Plain(200,  
200), material);  
scene.add(plain);
```



The logo for HTML GL, where the letters 'H', 'T', 'M', 'L', 'G', and 'L' are rendered in a white wireframe font. Each letter is composed of a complex network of white lines forming a mesh of triangles, giving it a 3D, geometric appearance. The letters are spaced out horizontally.

Renders HTML/CSS in WebGL

HTML GL

```

```

```
<html-gl>
```

```
  
```

```
</html-gl>
```


A wireframe illustration of a roller coaster track with multiple loops and drops, set against a black background. The track is composed of white lines, and the overall image has a technical, architectural feel.

Does this improves
performance only?

No!

The background of the slide is a dark gray to black gradient, overlaid with a white wireframe pattern that creates a series of rolling, mountain-like hills. The lines of the wireframe are thin and intersect to form a grid that follows the contours of the hills.

Some goodies for PhoneGap

[Demo](#)

Ring... Ring . . .

SONY®



SONY®

– Can you drop web
app into a 3D space
with HTML-GI?

– Sorry it is 2D only so far



Amber Wilson



8:19 PM



Live from PlayStation

ⓧ Enter



(sobbing hysterically)

A year later...

The background of the slide is a dark blue gradient. On the right side, there is a complex, abstract network of thin red lines connecting small red dots, resembling a molecular structure or a data network. The lines and dots are more concentrated on the right and fade out towards the left.

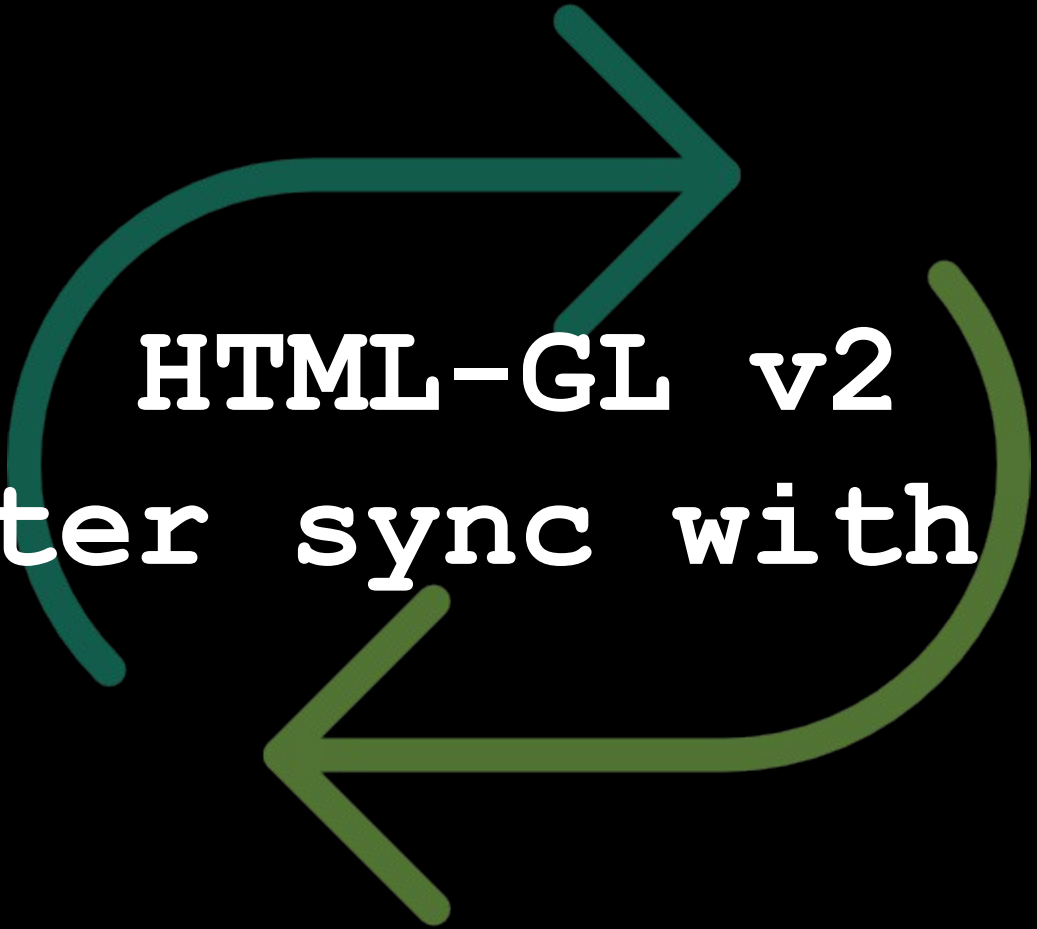
HTML GL

v2 Renders HTML/CSS
in WebGL and WebVR

Should we call it HTML2VR?



HTML-GI v2 is x10
more performant



HTML-GI v2

better sync with DOM



HTML-GL v2 is pluggable

Renderers, rasterizers

HTML-GL v2

three.js plugin

Three.js means WebVR



Not only porting
existing apps...

Creating UIs in 3D is expensive

HTML / CSS is way more efficient



The background is a dark, textured surface composed of a dense, interconnected network of thin, light-colored lines. These lines form a complex, organic pattern that resembles a wireframe mesh or a topographical map of a rugged landscape. The lines vary in thickness and orientation, creating a sense of depth and movement. The overall effect is a futuristic, digital, and somewhat chaotic aesthetic.

Creating UIs
for VR quickly

VR DEV: Bad parts

UNITY

```
GameObject canvasGO = new GameObject();  
RectTransform canvasRT =  
canvasGO.AddComponent<RectTransform>();  
Canvas canvasCV = canvasGO.AddComponent<Canvas>();  
canvasCV.RenderMode = RenderMode.ScreenSpaceCamera;  
Vector3 pos = Camera.main.transform.position;  
pos += Camera.main.transform.forward * 10.0f;  
canvasCV.worldCamera = Camera.main;
```

```
GameObject buttonGO = new GameObject();  
RectTransform buttonRT =  
buttonGO.AddComponent<RectTransform>();  
buttonRT.SetParent(canvasRT);  
buttonRT.sizeDelta = new Vector2(200.0f, 100.0f);  
Button buttonBU = buttonGO.AddComponent<Button>();  
buttonBU.onClick.AddListener( () => {
```

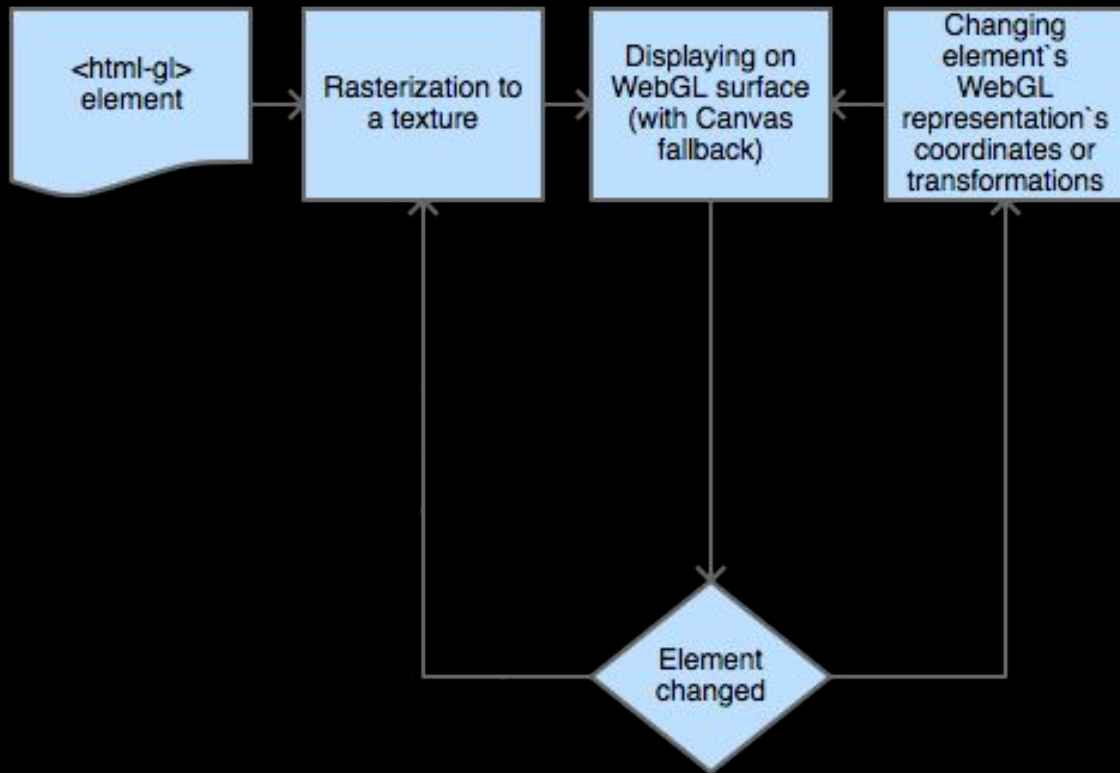
Three.js

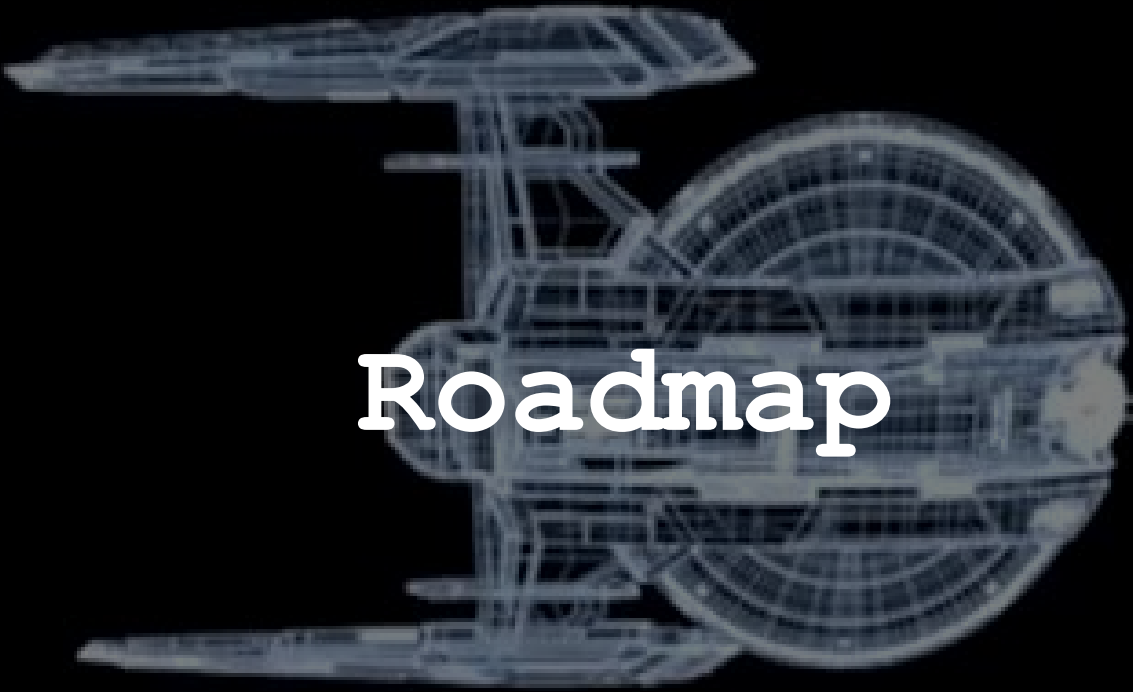
```
var gui = new THREE.SimpleDatGui();  
gui.add(myFunctions, 'RESET_EVENT').name('Reset  
Position');  
gui.add(gui_options,  
'CONNECT_TO_OCULUS_RIFT').name('Oculus  
Control').onChange(function(value) {  
    oculusRiftControl.setActive(value);  
});  
gui.add(gui_options,  
'TRANSPARENT').name('Tranparent').onChange(function(  
value) {  
    gui_options.OPACITY = (value) ? 80 : 100;  
});  
gui.add(gui_options, 'OPACITY', 10,  
100).step(10).name('Opacity').onChange(function(val  
ue) {  
    gui_options.TRANSPARENT = !(value == 100);
```

Demo time

How it works?

The flow





Roadmap

vr.yourdomain.com

WebVR as a progressive
enhancement?

WordPress WebVR plugin

WebVR as a progressive
enhancement?

A-Frame plugin

<a-html>

Text rendering optimizations with SDF



ReactVR

by Oculus/Facebook

What is this?

HTMLGL.COM

Questions?

github.com/PixelsCommander/HTML-GL

@PixelsCommander

Thank you!
Bye!

