Migrating Web apps to Virtual Reality

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@PixelsCommander

LIBERTY GLOBAL

TV STB Operating system, 500 000 lines of JavaScript

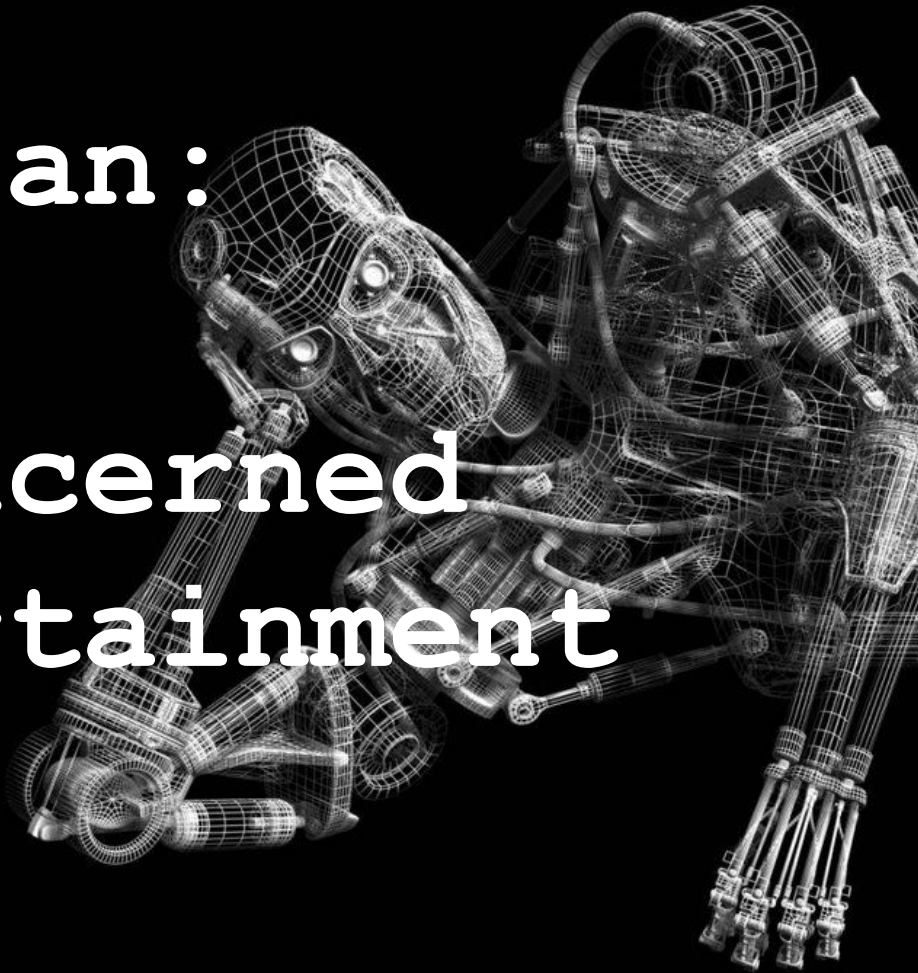

This is not just about TVs
working in Entertainment department

Porn drives the world

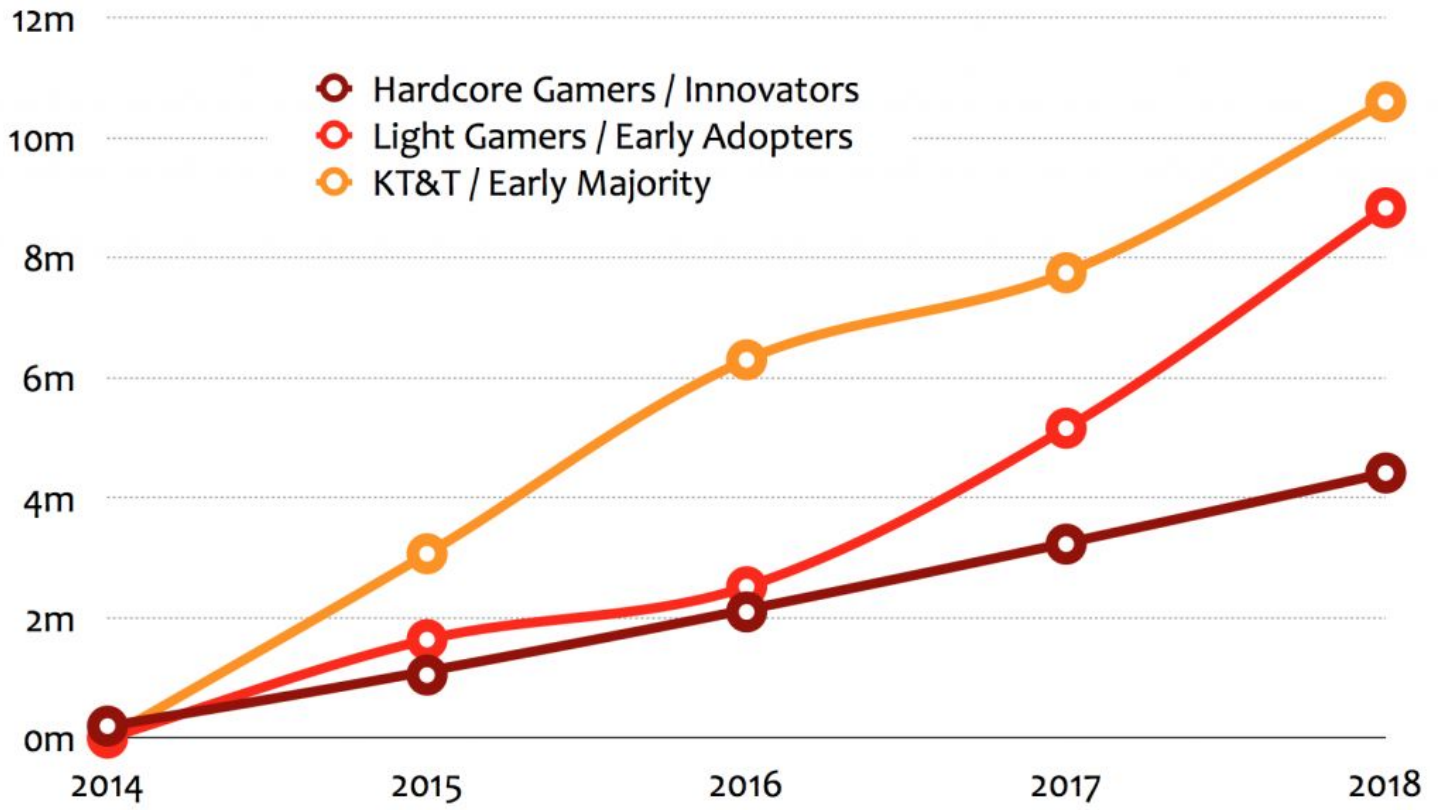
And VR porn is coming

Sorry, I mean:

"We are concerned about entertainment trends"



Annual Unit Sales for Consumer Virtual Reality Devices



KZERO WORLDSWIDE

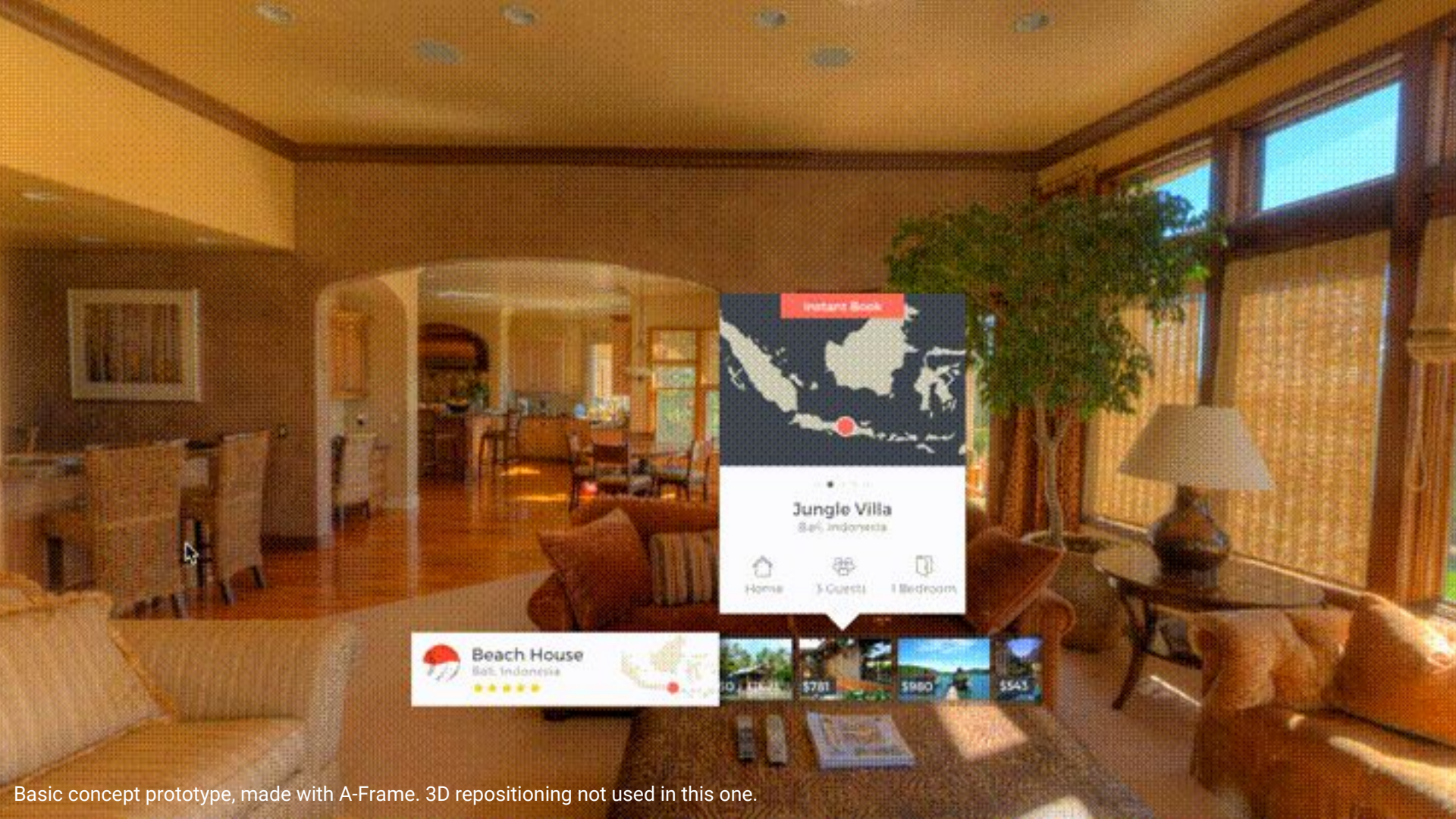

Why drop web apps
to VR?

Example

You made a car customization web app

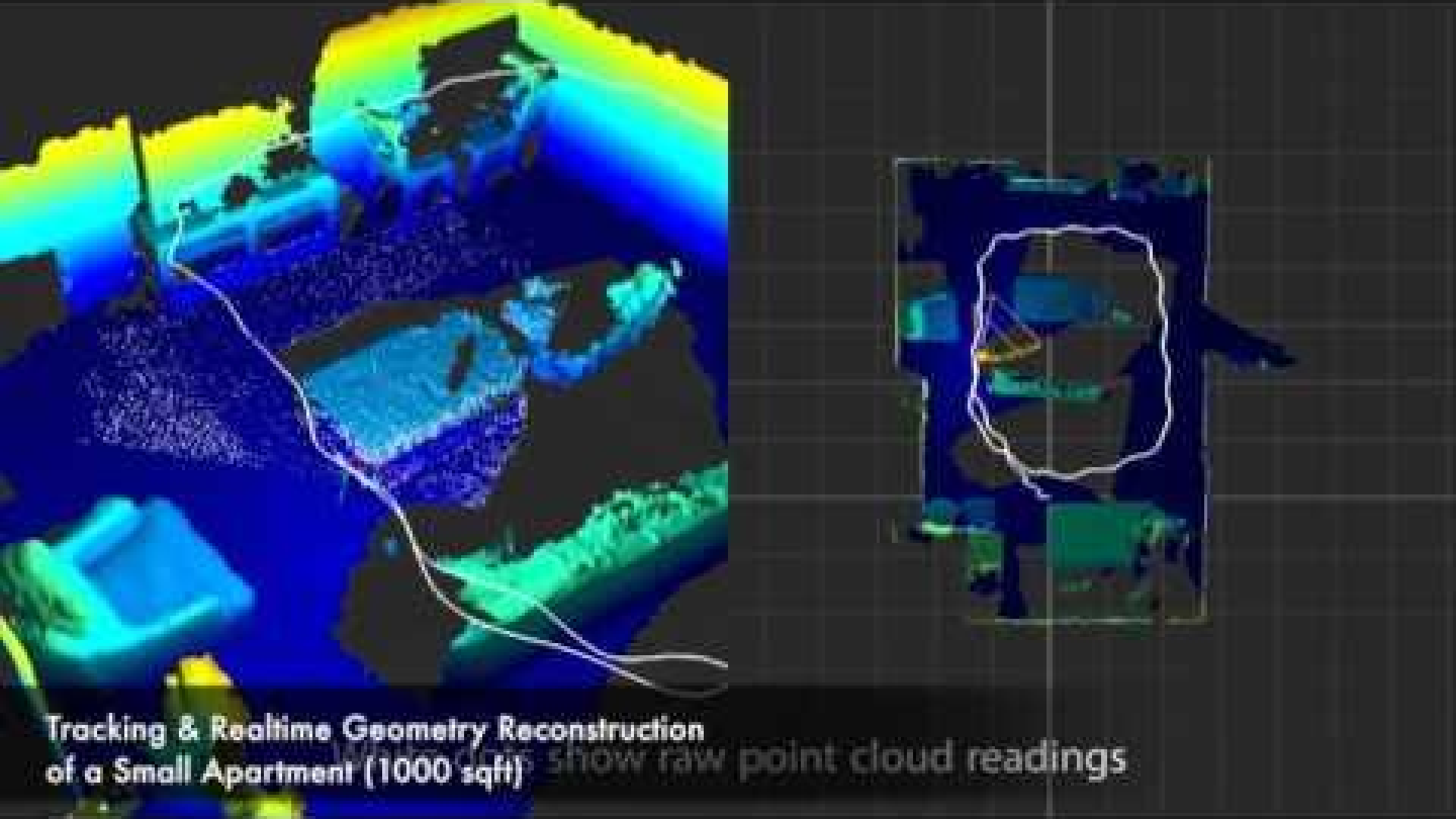
Example

You made a real estate catalog as a web app



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

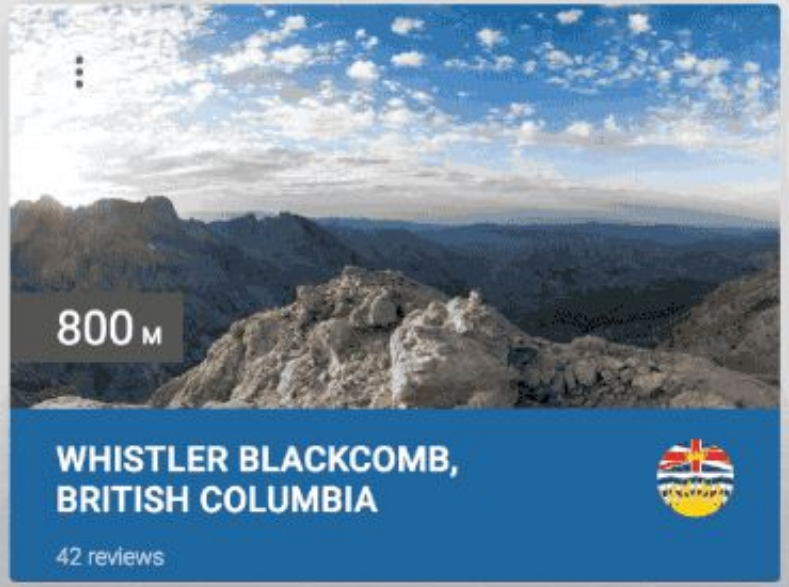
Nice to know about real estate 3d revolution:


Tracking & Realtime Geometry Reconstruction
of a Small Apartment (1000 sqft)
show raw point cloud readings

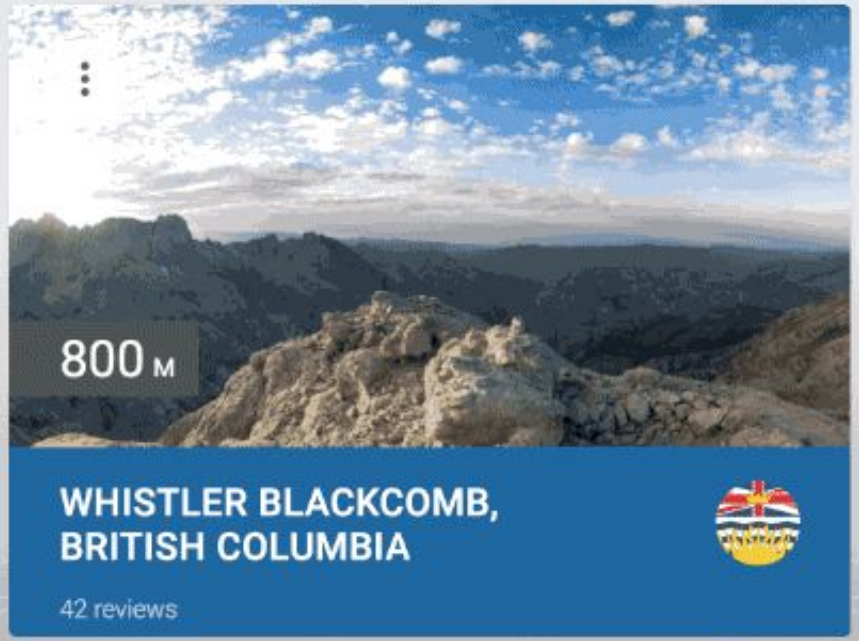
So…

Virtual Reality provides new experiences for customers

Not just a flat picture

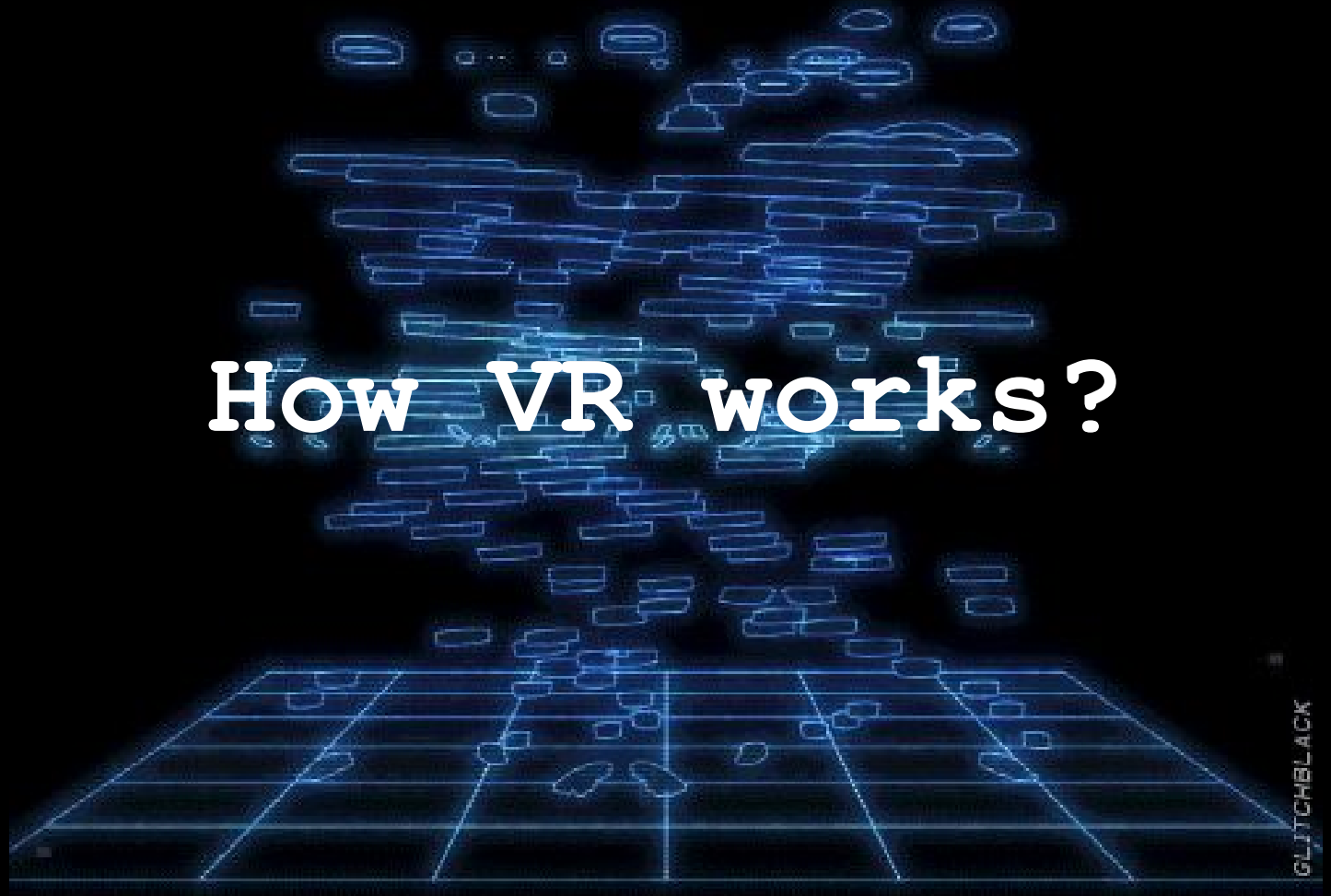


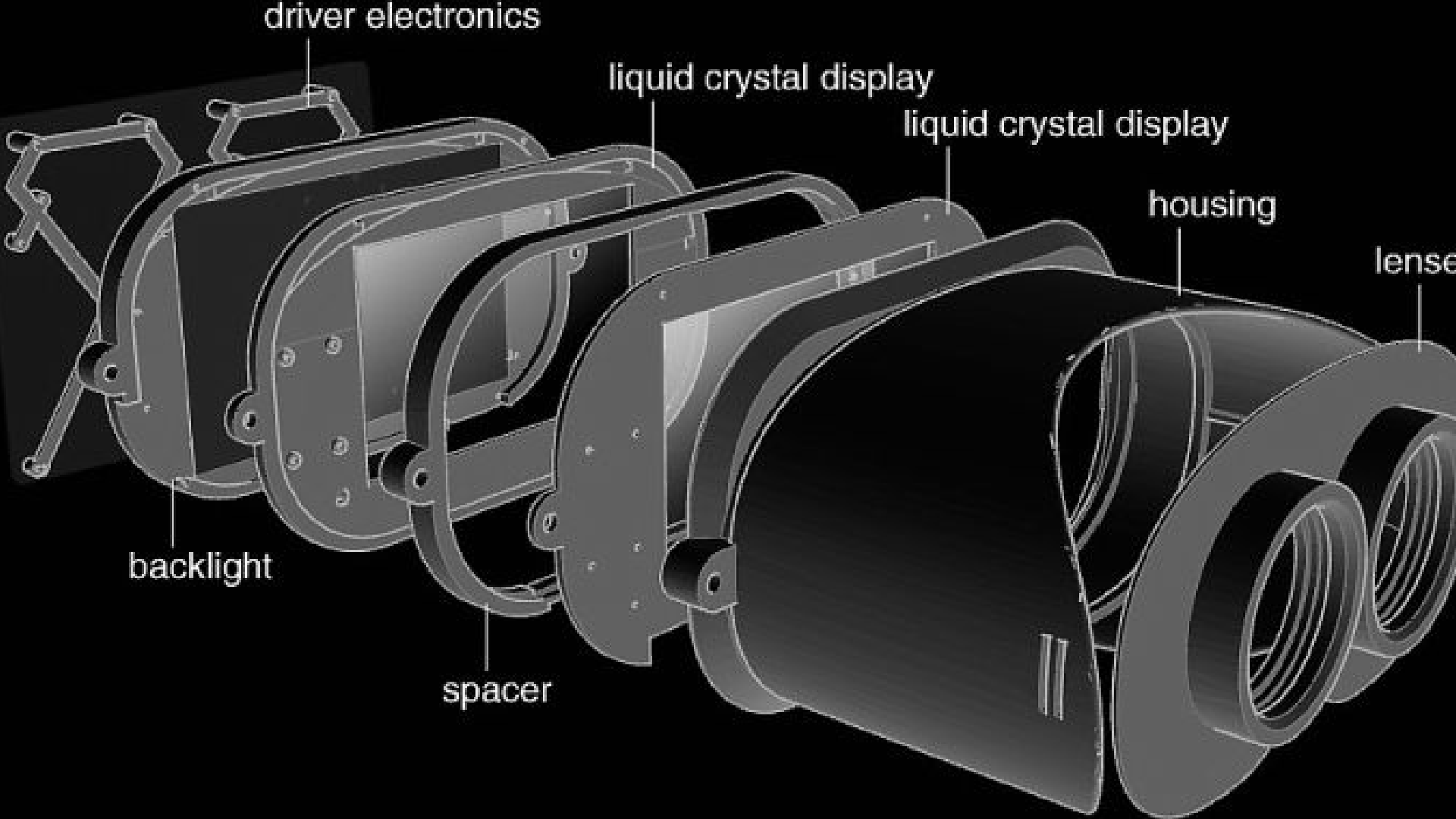
Your site just works, “for free”. But the site is stuck inside a small window. Developers should be able to fill the entire 360 environment.



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

How VR works?




driver electronics
liquid crystal display
liquid crystal display
housing
lense
backlight
spacer


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
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The Room
STORE
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The Room

VR DEV: Good parts

VR DEV: Bad parts

UNITY

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Canvas canvasCV = canvasGO.AddComponent<Canvas>();
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pos  += Camera.main.transform.forward * 10.0f;
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buttonRT.SetParent(canvasRT);
buttonRT.sizeDelta = new Vector2(200.0f, 100.0f);
Button buttonBU = buttonGO.AddComponent<Button>();
buttonBU.onClick.AddListener( () => {
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Three.js

```
var gui = new THREE.SimpleDatGui();
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});
gui.add(gui_options, 'TRANPARENT').name('Tranparent').onChange(function(value) {
    gui_options.OPACITY = (value) ? 80 : 100;
});
gui.add(gui_options, 'OPACITY', 10, 100).step(10).name('Opacity').onChange(function(value) {
    gui_options.TRANPARENT = !(value == 100);
});
```
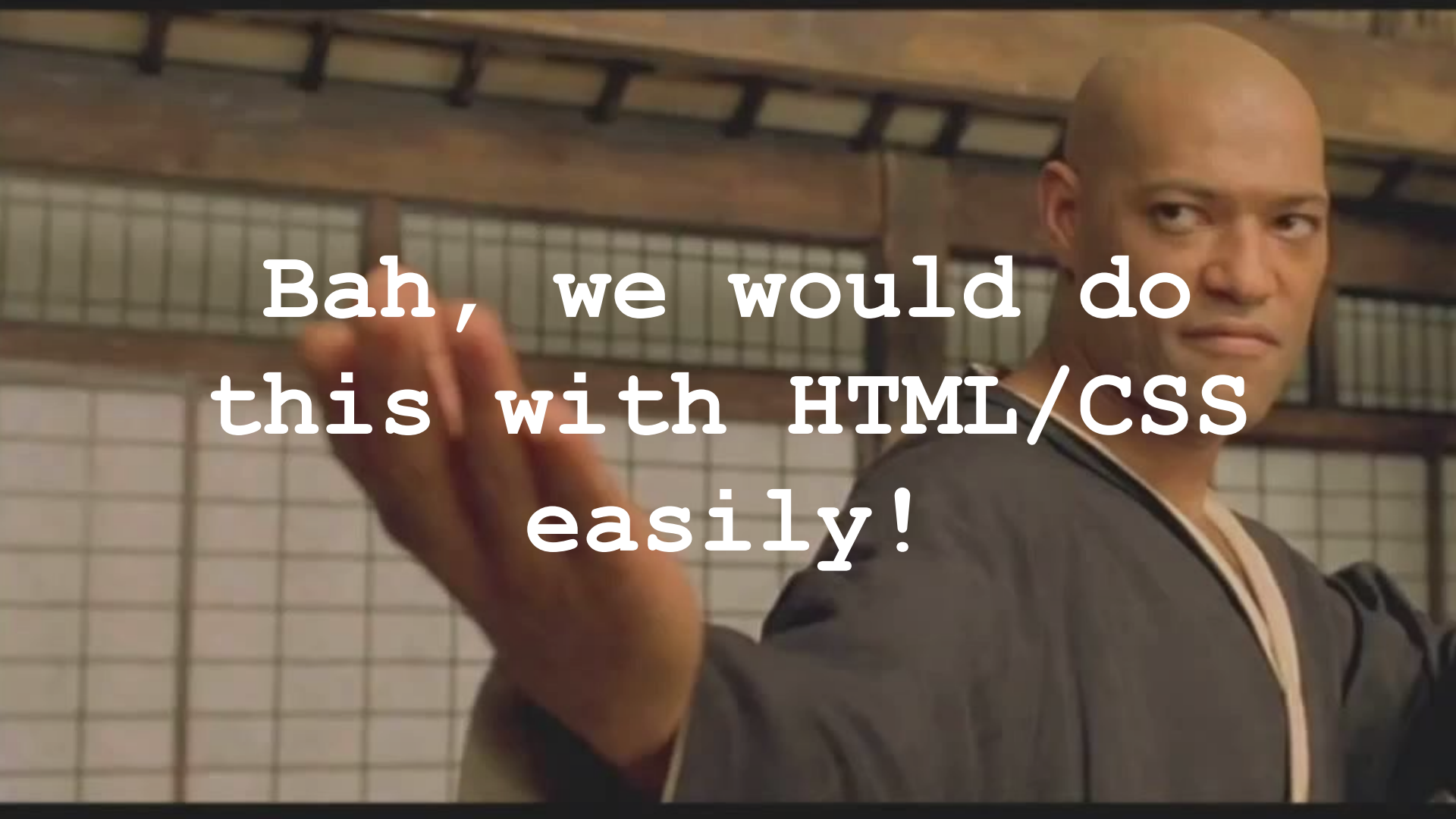

Step backward for front-end ninjas


Daydream
GREAT WHITE SHARK
STAR CHART
CLARO
ARC SLINGER
WSJ


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

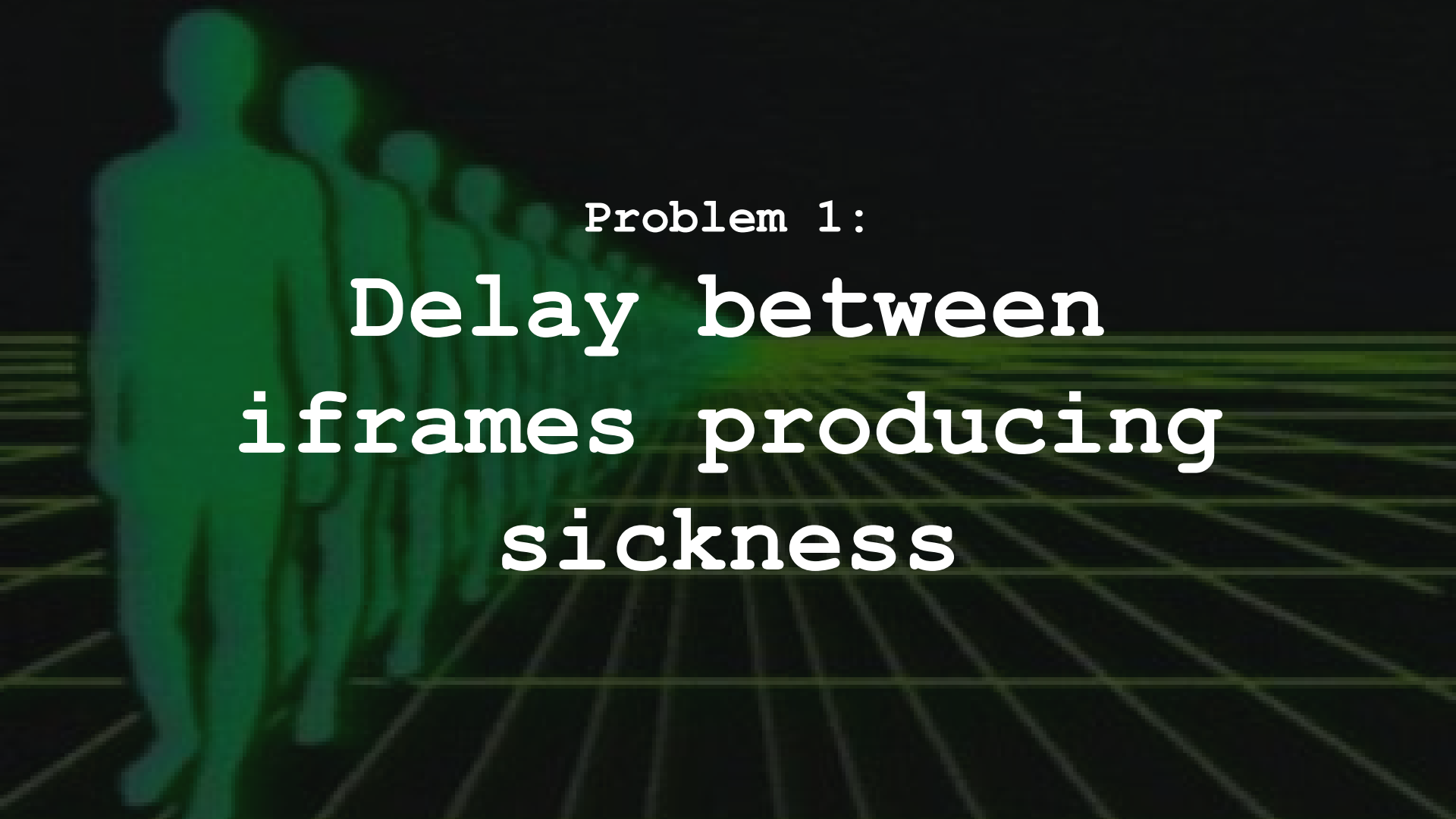
Demo, Demo2

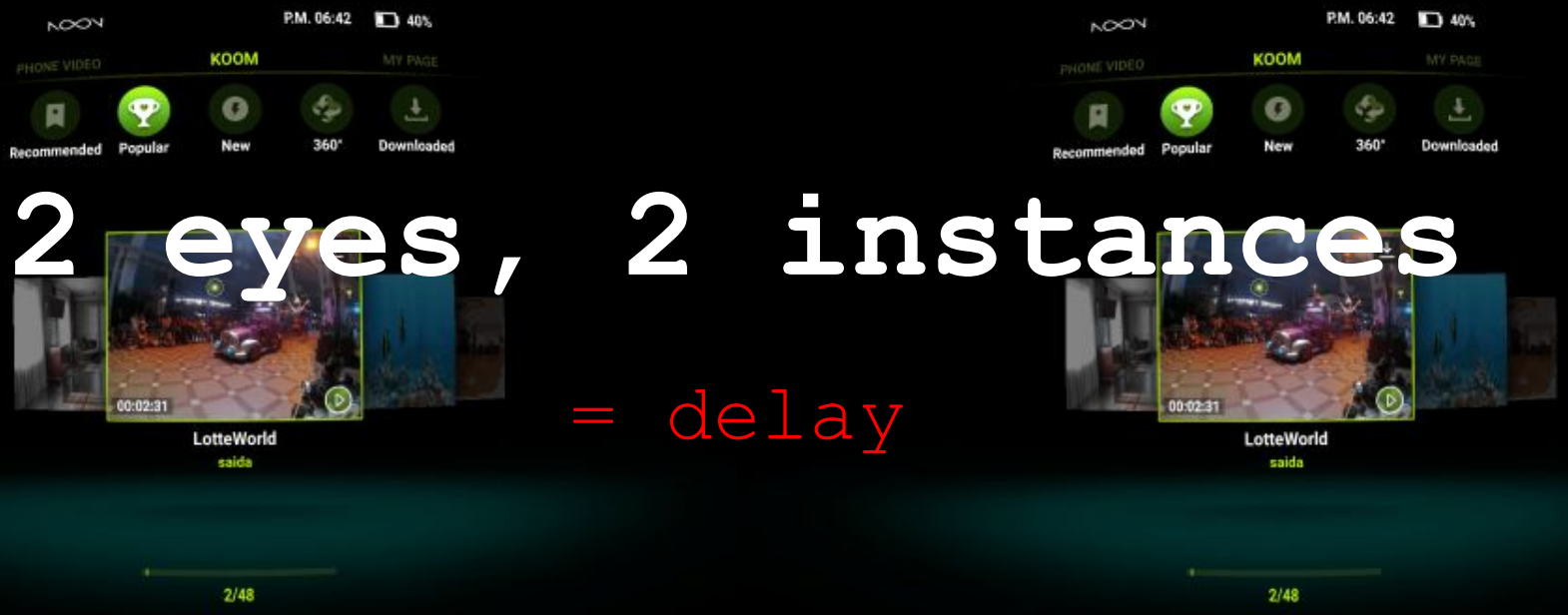
2 eyes, 2 iframes

CLOSE

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

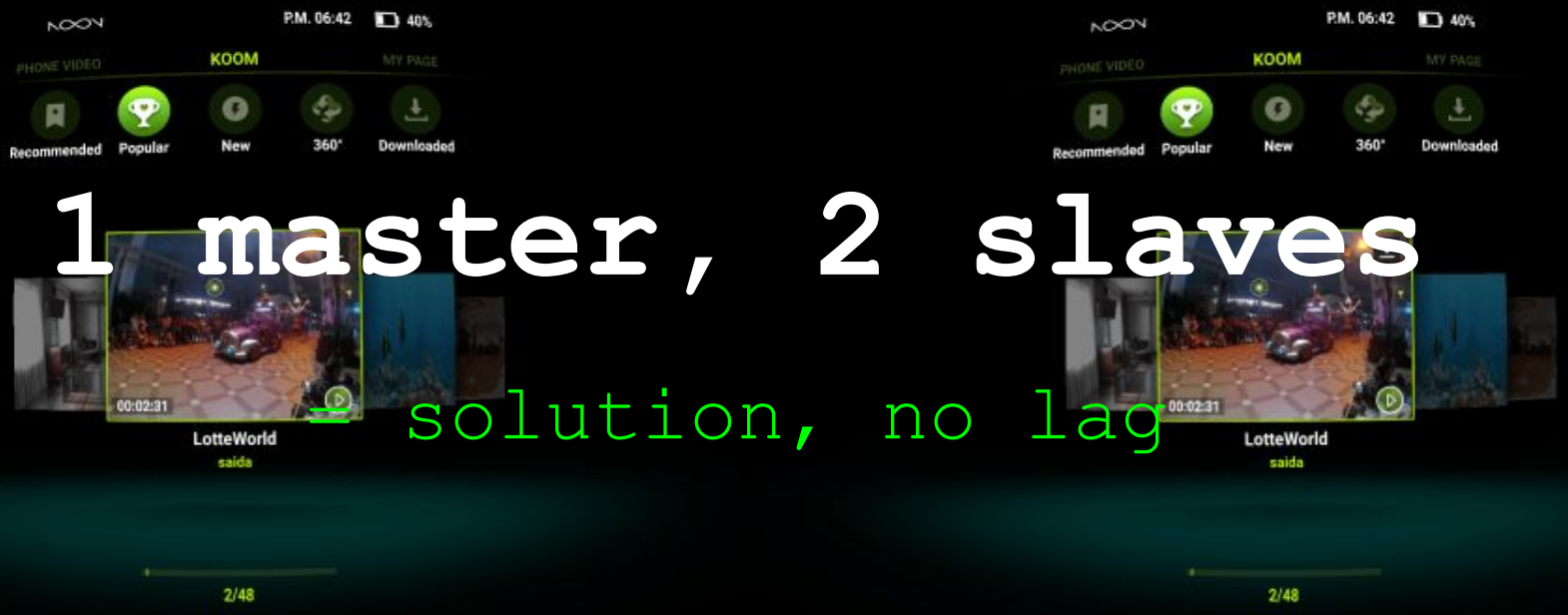
– No


Problem 1:
Delay between iframes producing sickness



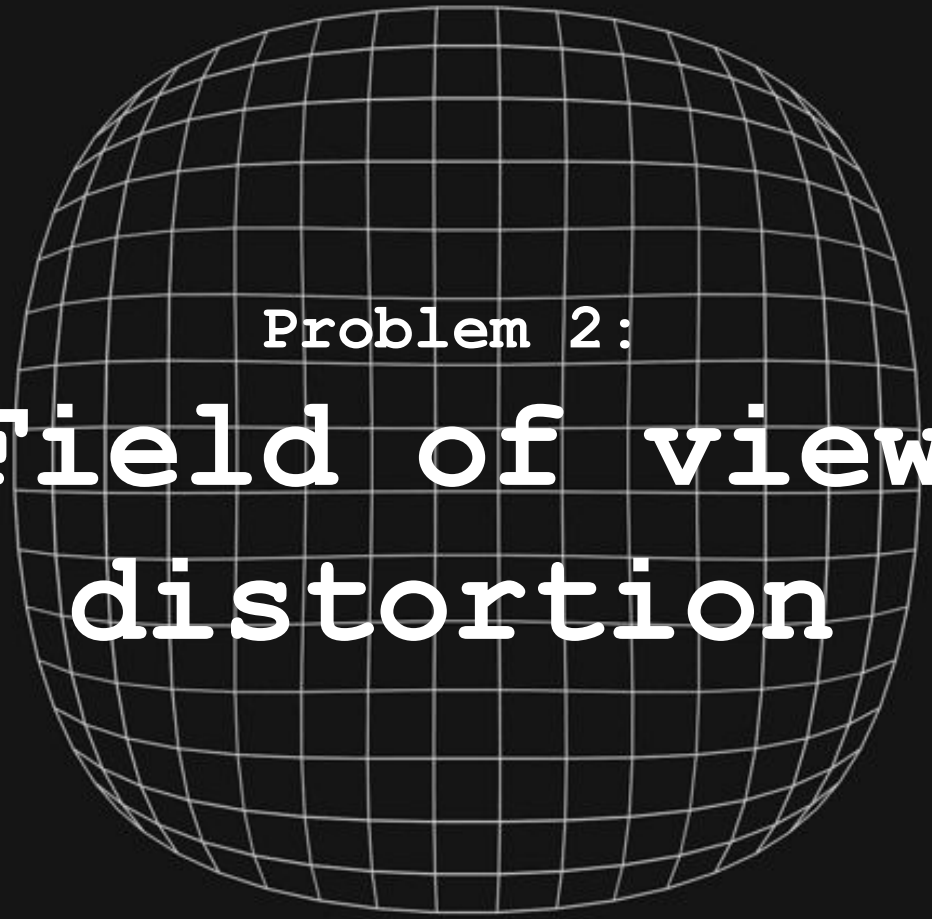
2 eyes, 2 instances

= delay



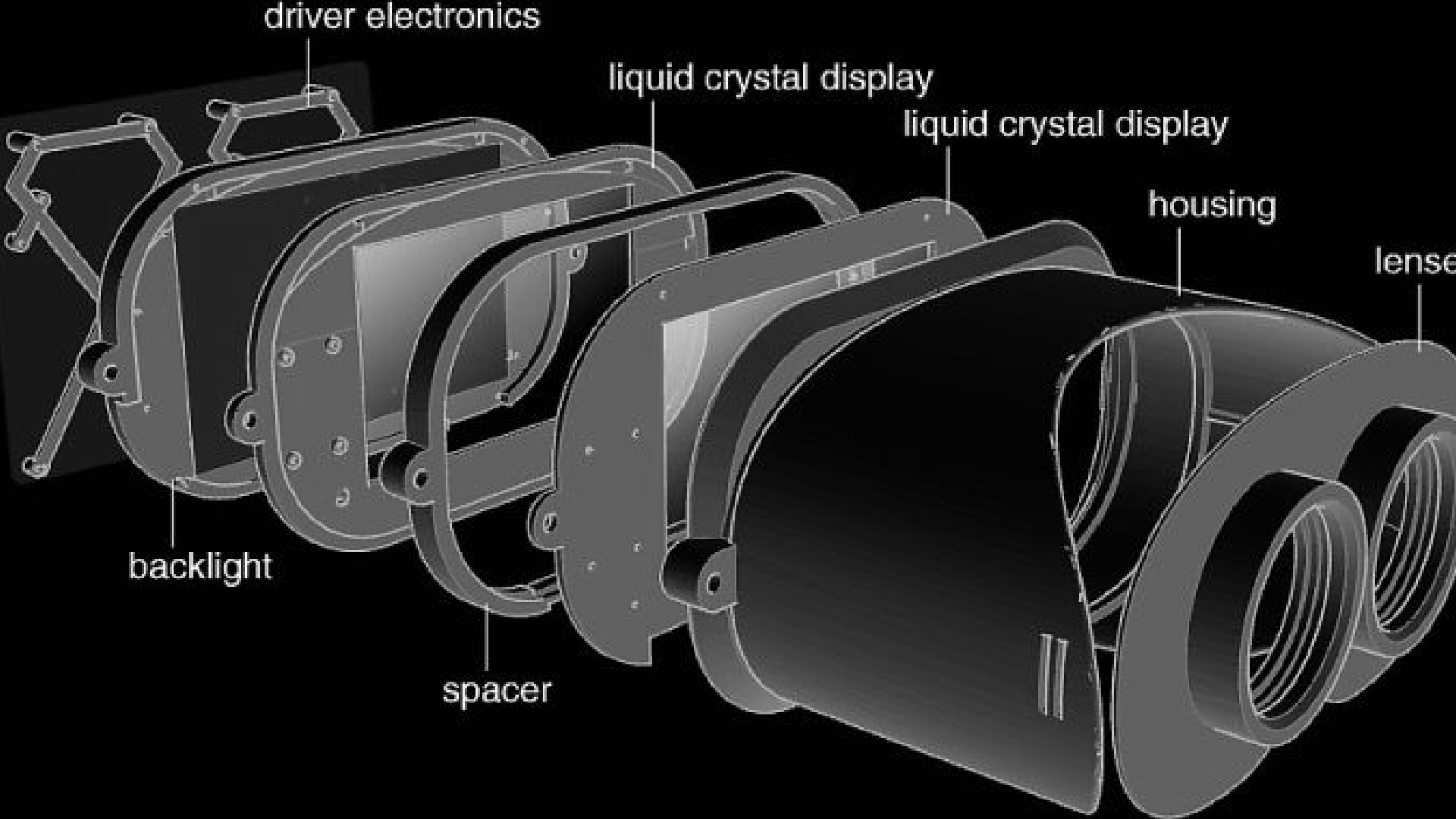
1 master, 2 slaves

= solution, no lag

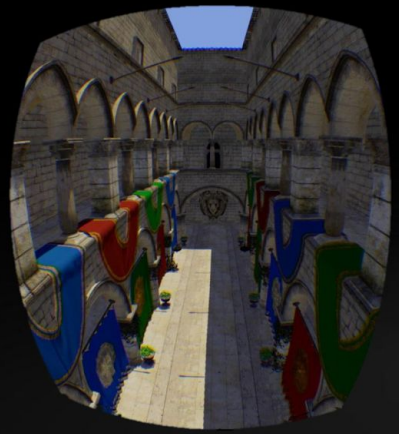


Problem 2:

Field of view distortion

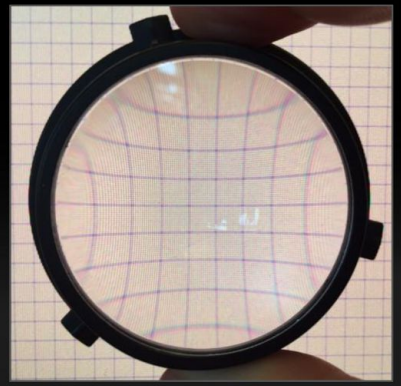

driver electronics
liquid crystal display
liquid crystal display
housing
lense
backlight
spacer

Field of view enhancement



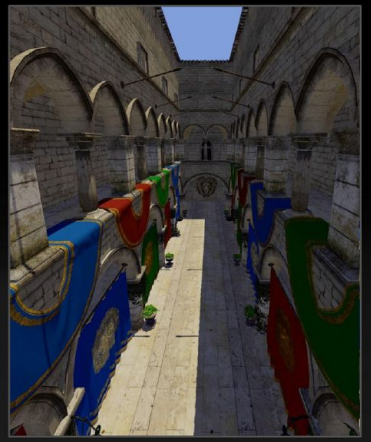
LCD Display

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



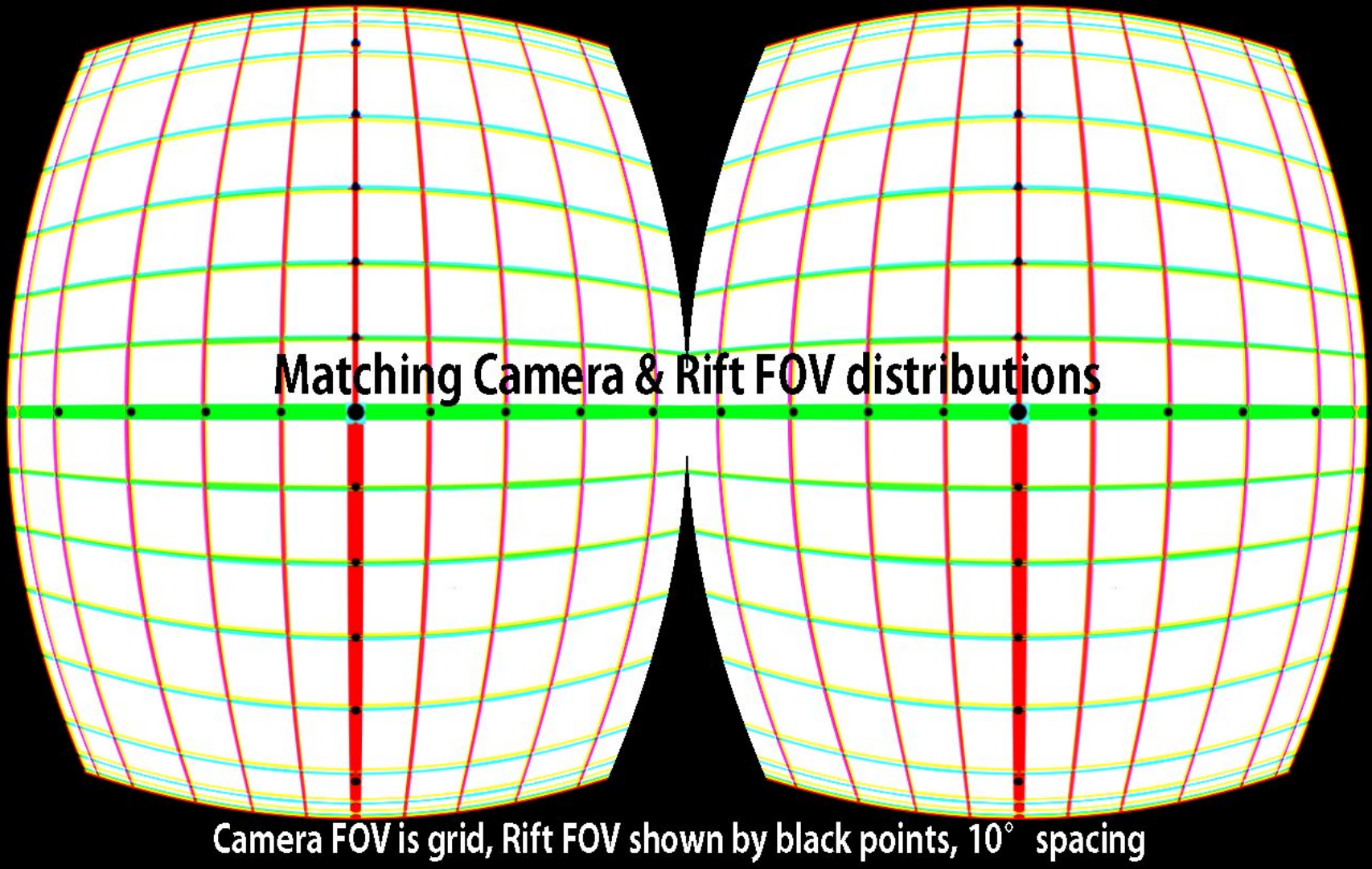
Optics

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

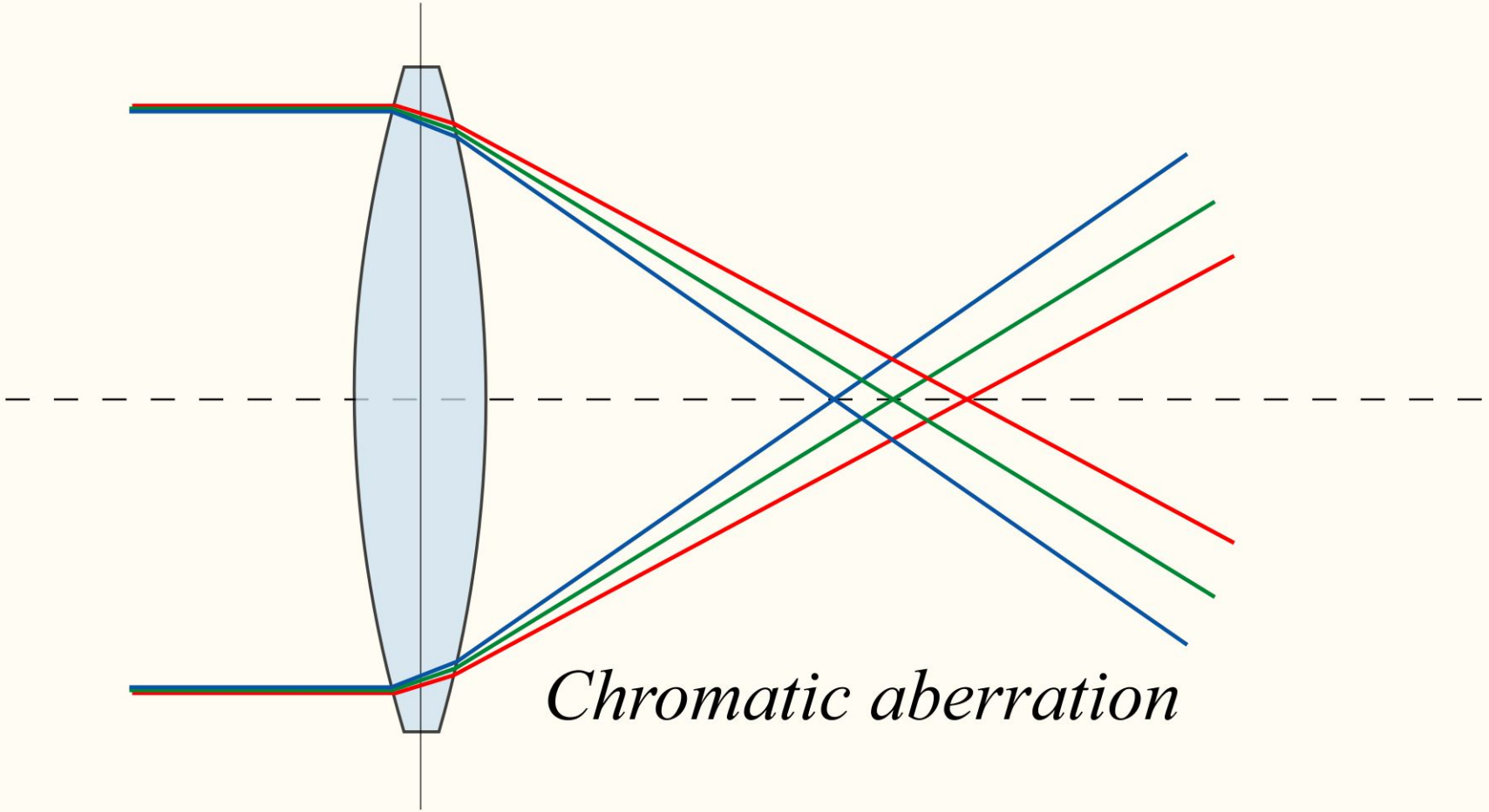


User’s view

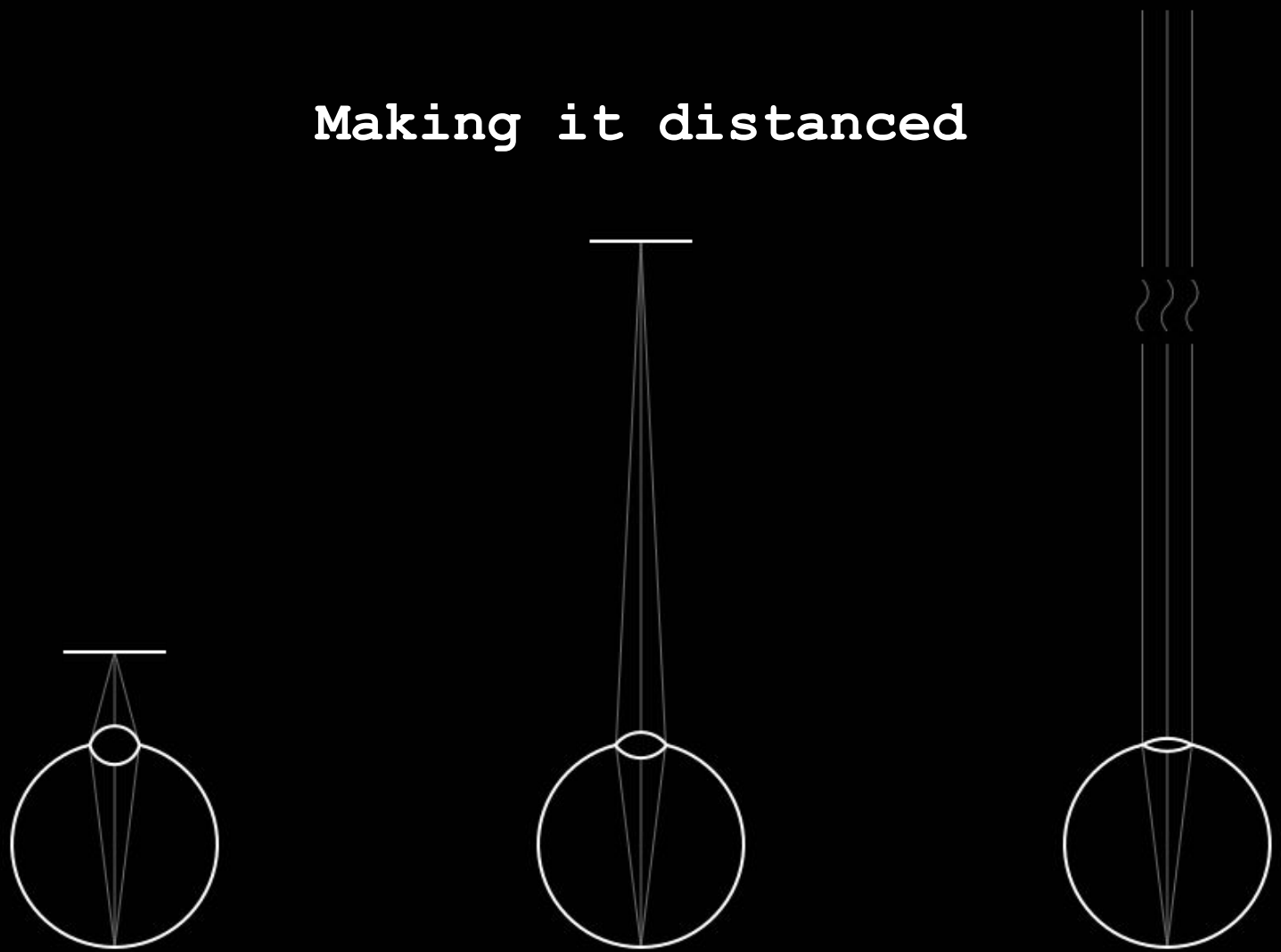
User sees correctly proportioned (not fisheye) scene with wide field of view


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


Problem 3:
Chromatic aberration

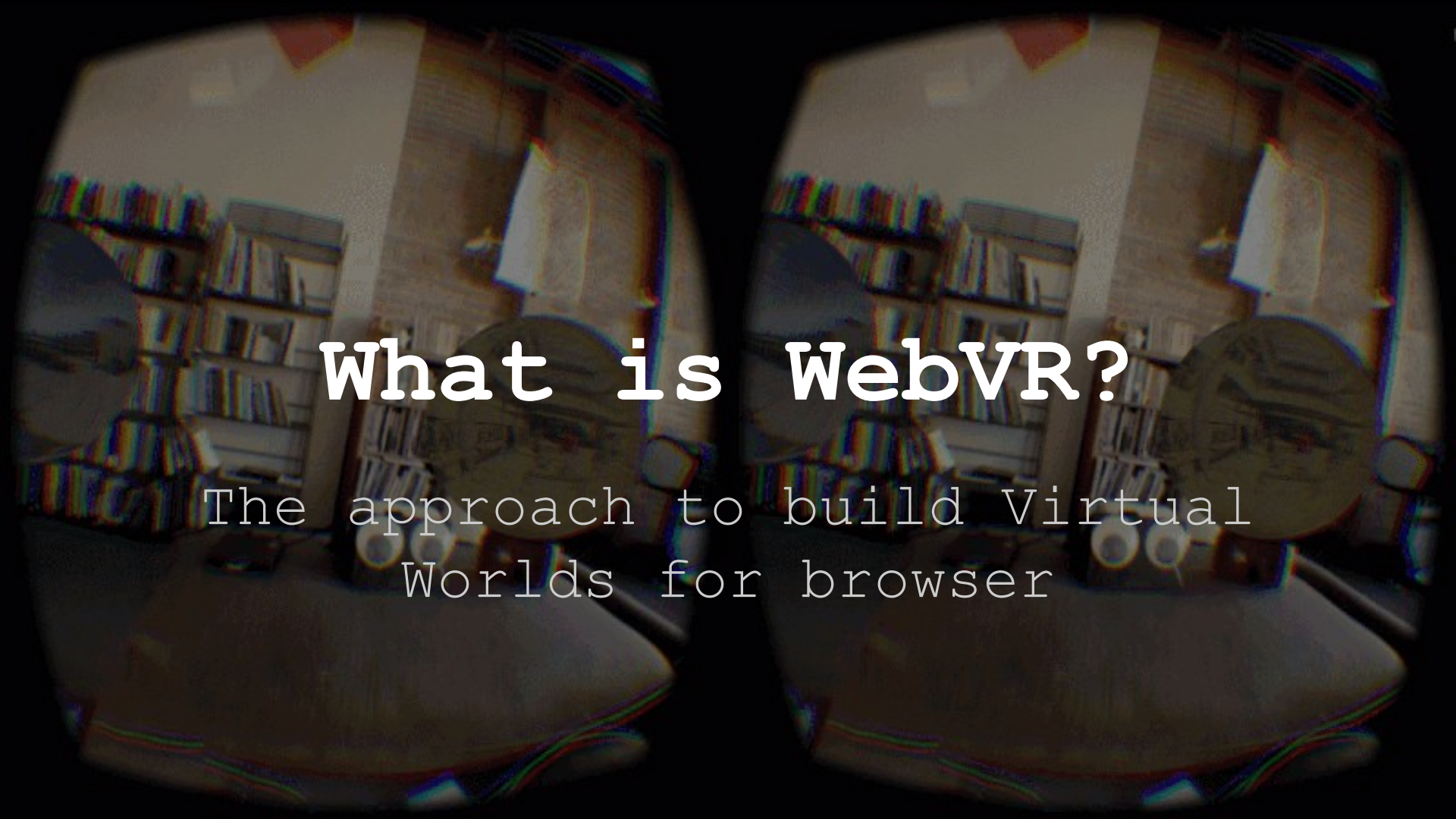

Chromatic aberration

Making it distanced



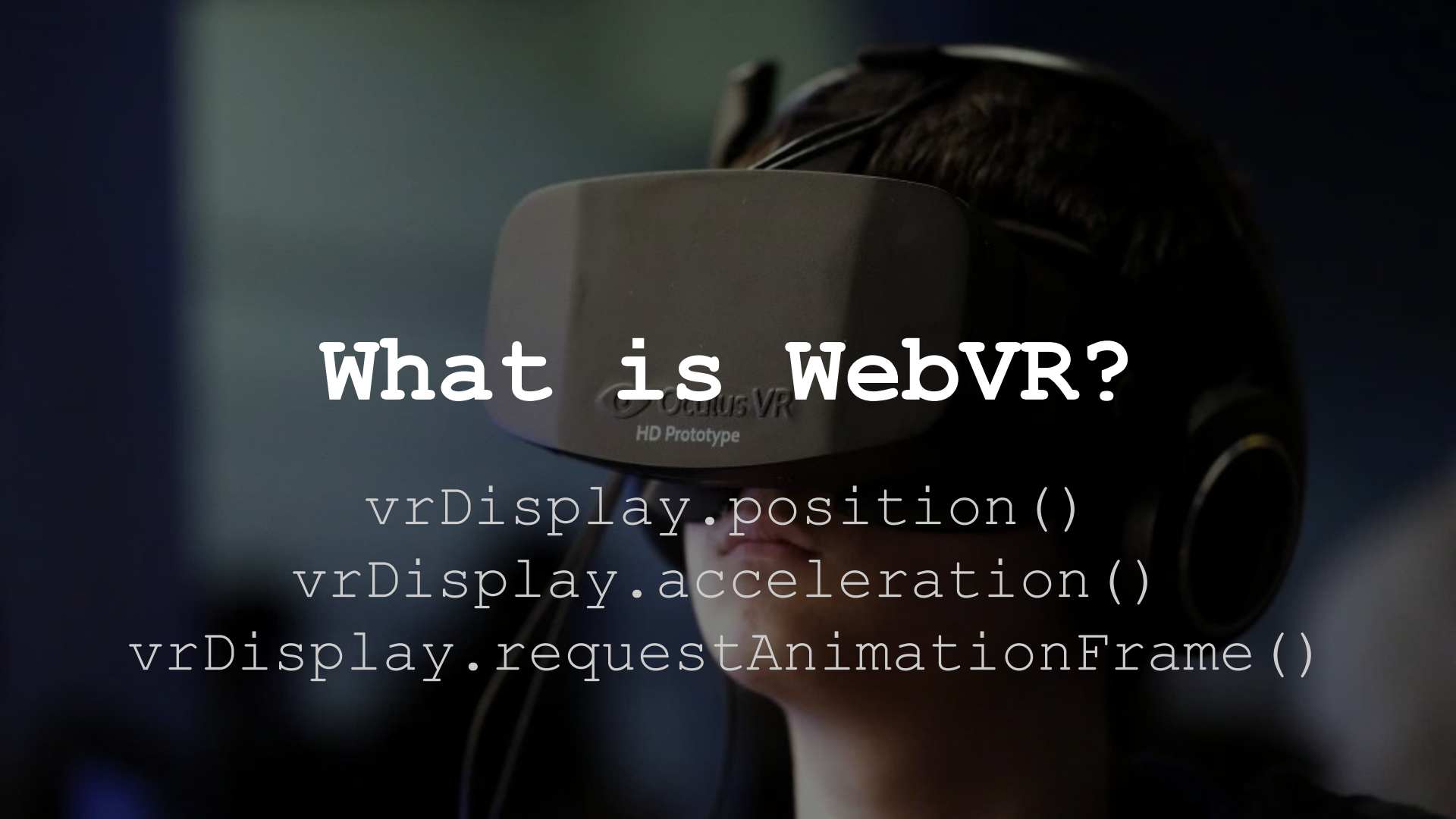
Sorry, no CSS3D, seriously

We need shaders to apply
FOV transformation
and chromatic aberration


What is WebVR?
The approach to build Virtual Worlds for browser

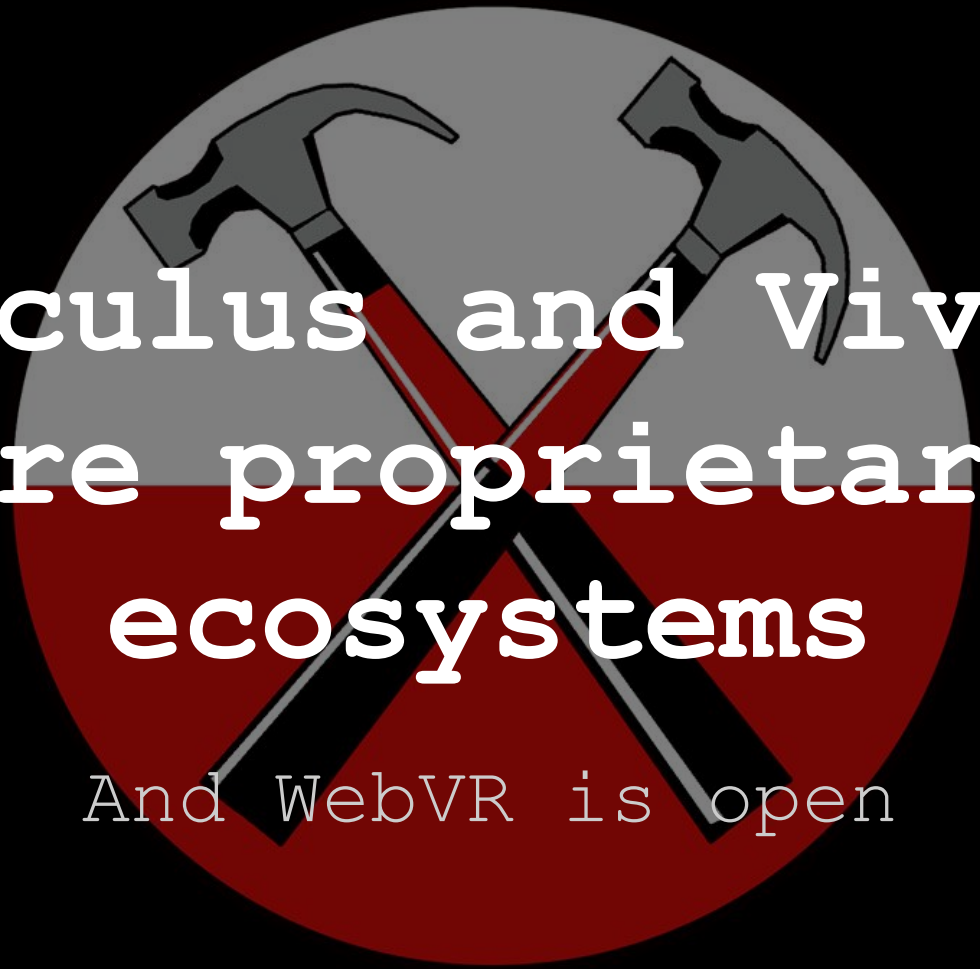
What is WebVR?

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



What is WebVR?

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



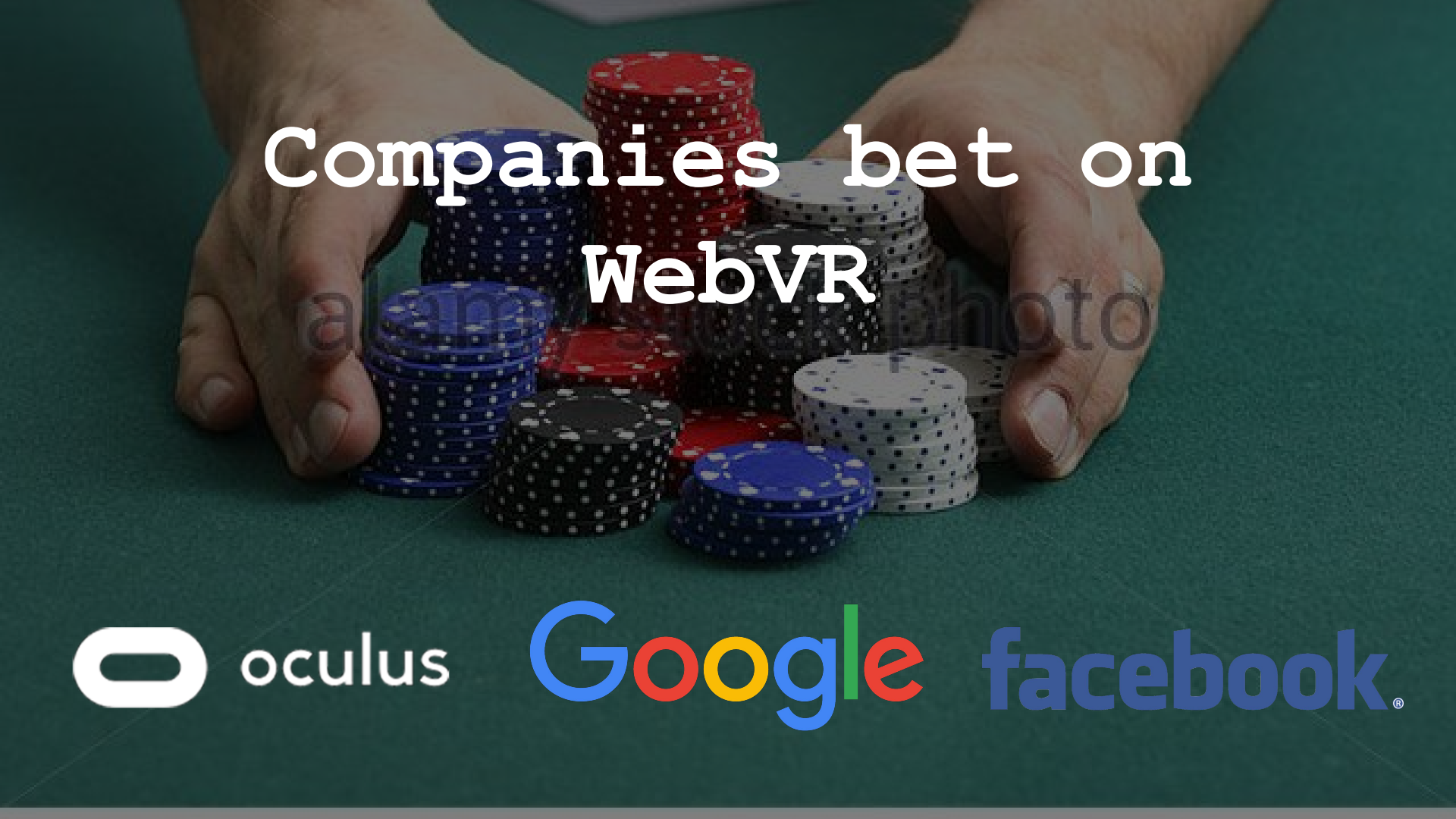
Oculus and Vive are proprietary ecosystems

And WebVR is open

WebVR support

WebVR is instant

No need to download something


Companies bet on
WebVR
oculus
Google
facebook

WebVR mostly uses Three.js

ThreeVR, ThreeVREffect plugins

WebVR: Bad parts

HTML

```
<img src=”back.png”>
```

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);
```

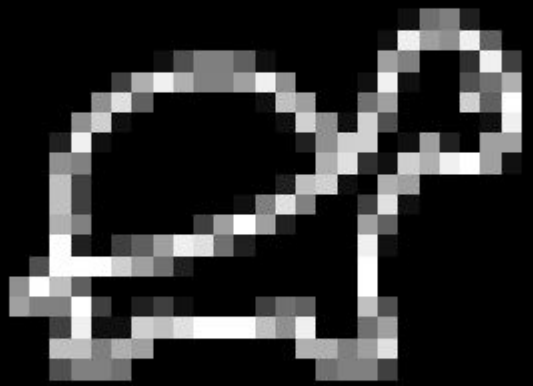

Wait a minute...

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!


Why do not we use WebGL for content?
Imperative, verbose, no layout

WebGL: Bad parts

HTML

```
<img src=”back.png”>
```

WebGL (three.js)

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var plain = new THREE.Mesh(new THREE.Plain(200,
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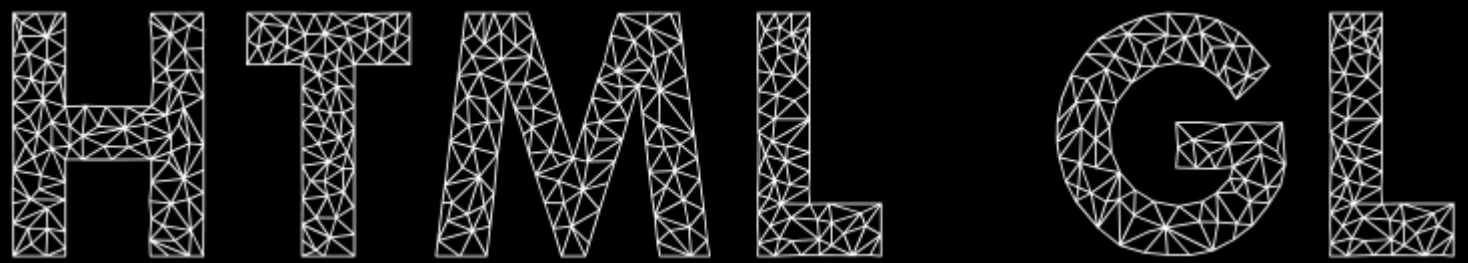
```


FUCKYEAHADVENTURETIMEGIFS
NEW EPISODE
CN HD



Renders HTML/CSS in WebGL

HTML GL

```
<img src=”back.png”>
```

```
<html-gl>
    <img src=”back.png”>
</html-gl>
```

Does this improves performance only?

No!

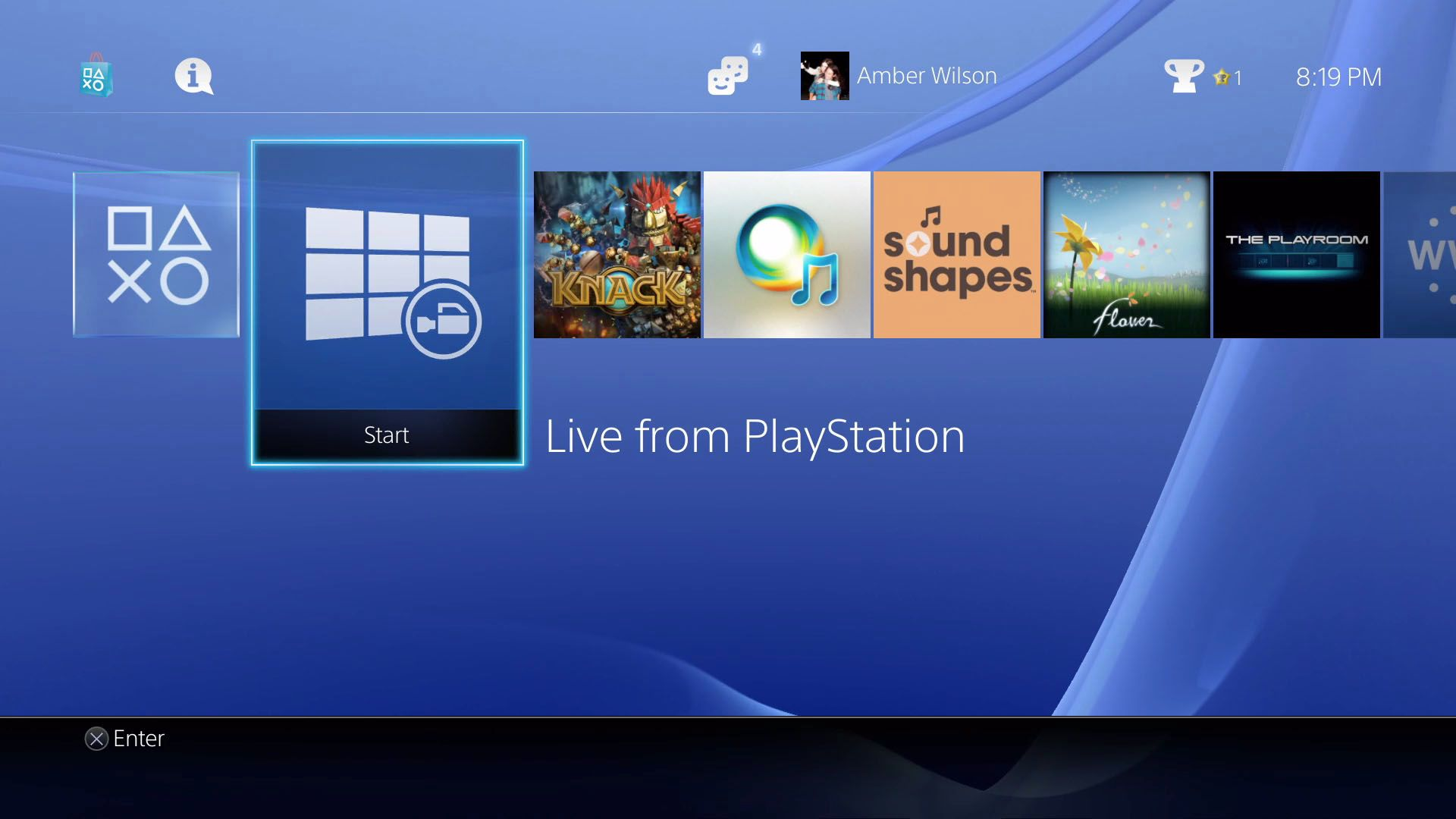
Some goodies for PhoneGap

Demo

Ring… Ring...

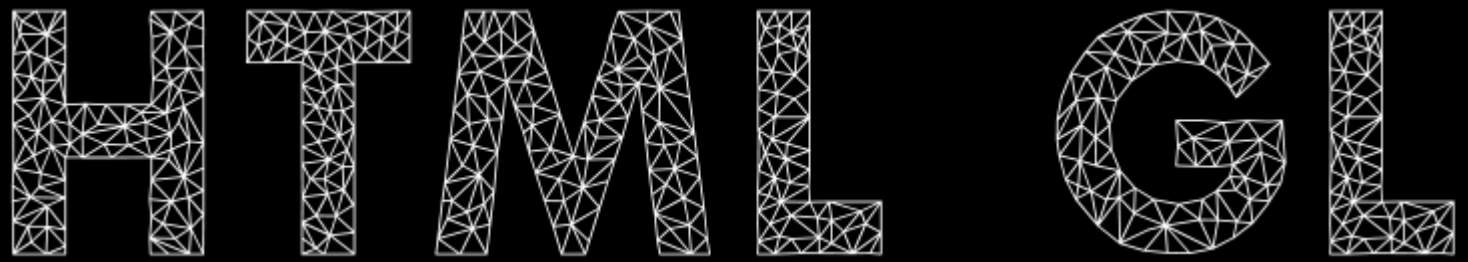

SONY


SONY
- Can you drop web app into a 3D space with HTML-GL?
- Sorry it is 2D only so far


4
Amber Wilson
1
8:19 PM
Start
KNACK
sound shapes
Flower
THE PLAYROOM
Live from PlayStation
Enter


(sobbing hysterically)

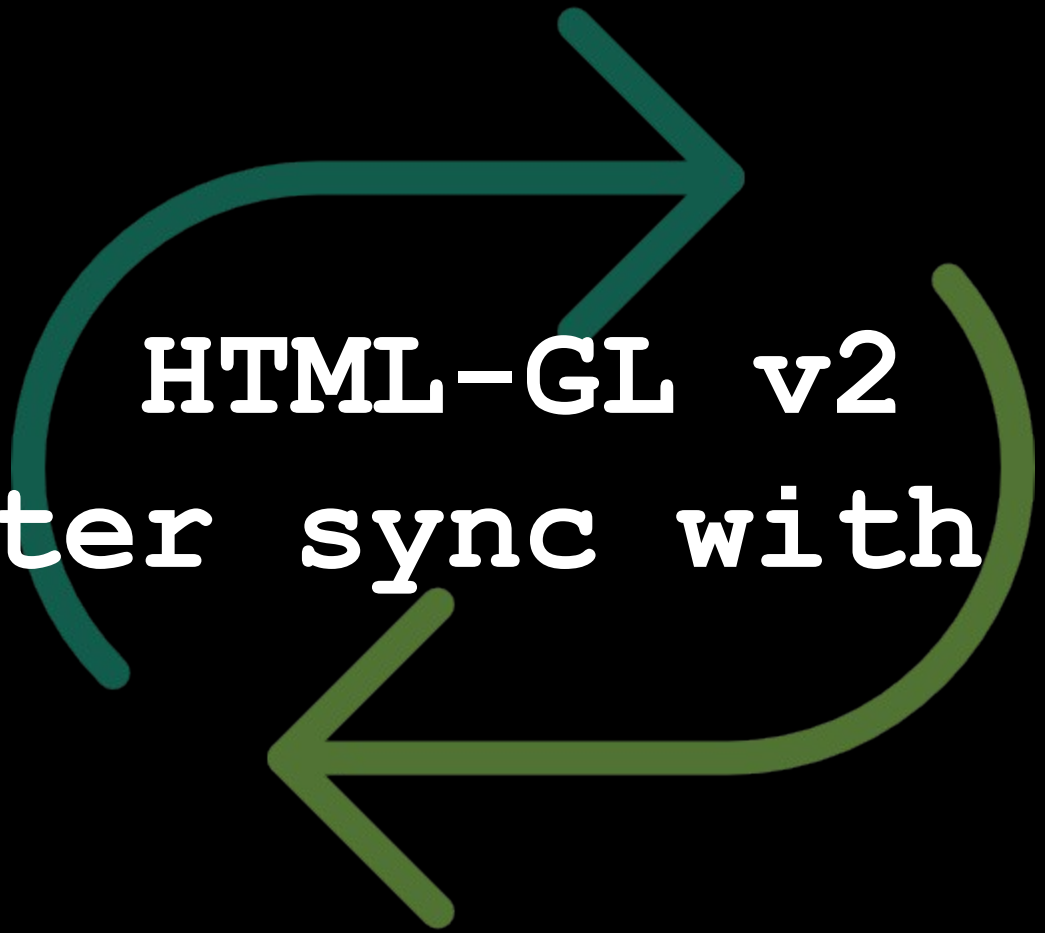

A year later...



v2 Renders HTML/CSS
in WebGL and WebVR

Should we call it HTML2VR?

HTML-GL v2 is x10 more performant



HTML-GL 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


Creating UIs
for VR quickly

VR DEV: Bad parts

UNITY

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```
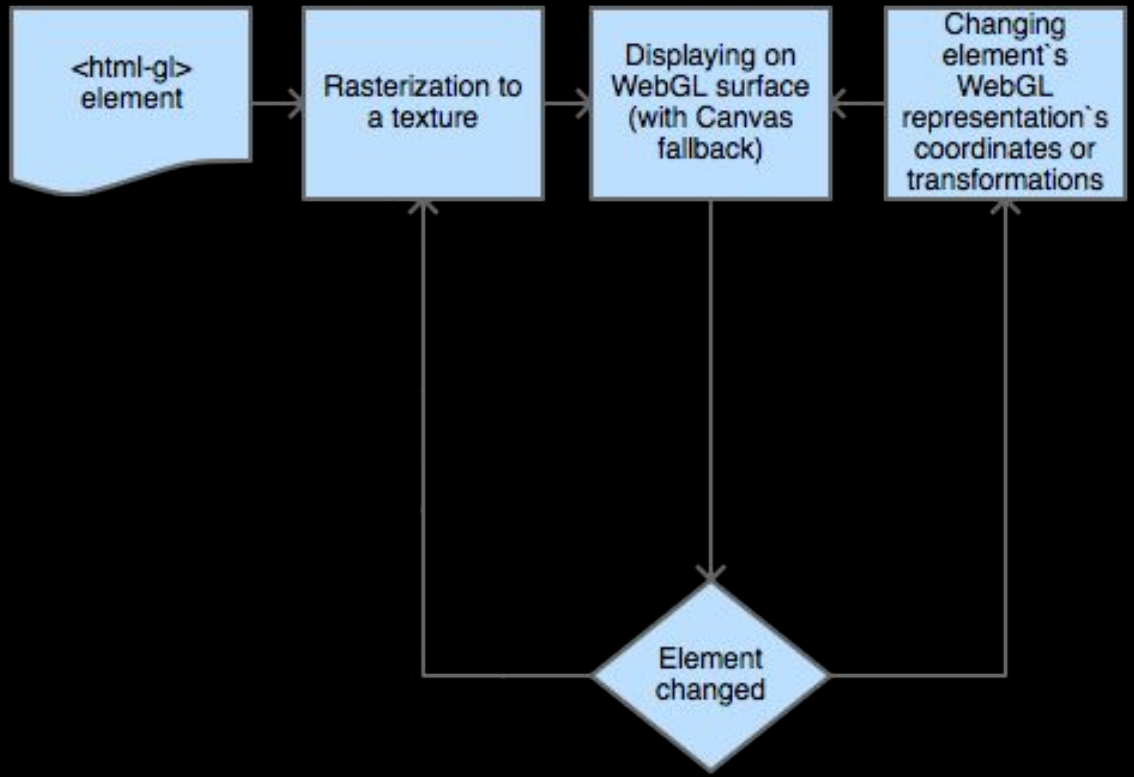
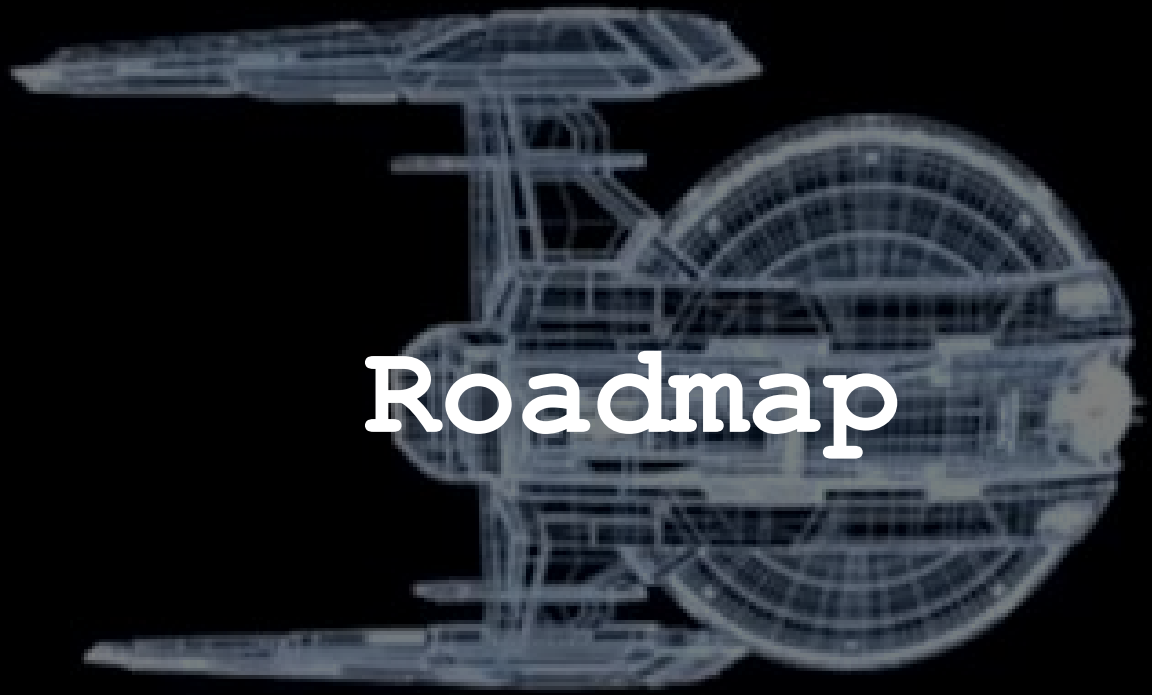

Demo time

How it works?

The flow


<html-gl> element
Rasterization to a texture
Displaying on WebGL surface (with Canvas fallback)
Changing element`s WebGL representation`s coordinates or transformations
Element changed



Roadmap

vr.yourdomain.com

WebVR as a progressive enchancement?

WordPress WebVR plugin

WebVR as a progressive enchancement?

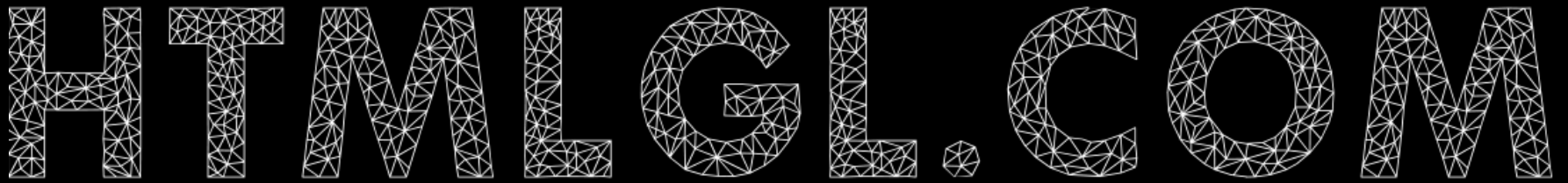
A-Frame plugin

<a-html>

Text rendering optimizations with SDF

ReactVR
by Oculus/Facebook

What is this?



Questions?

github.com/PixelsCommander/HTML-GL

@PixelsCommander

Thank you!
Bye!