Immersive Web for Mixed Reality

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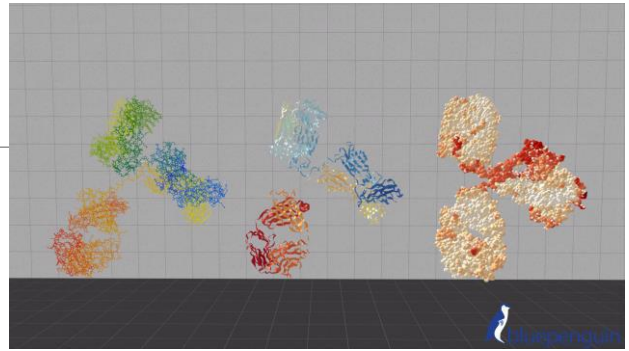
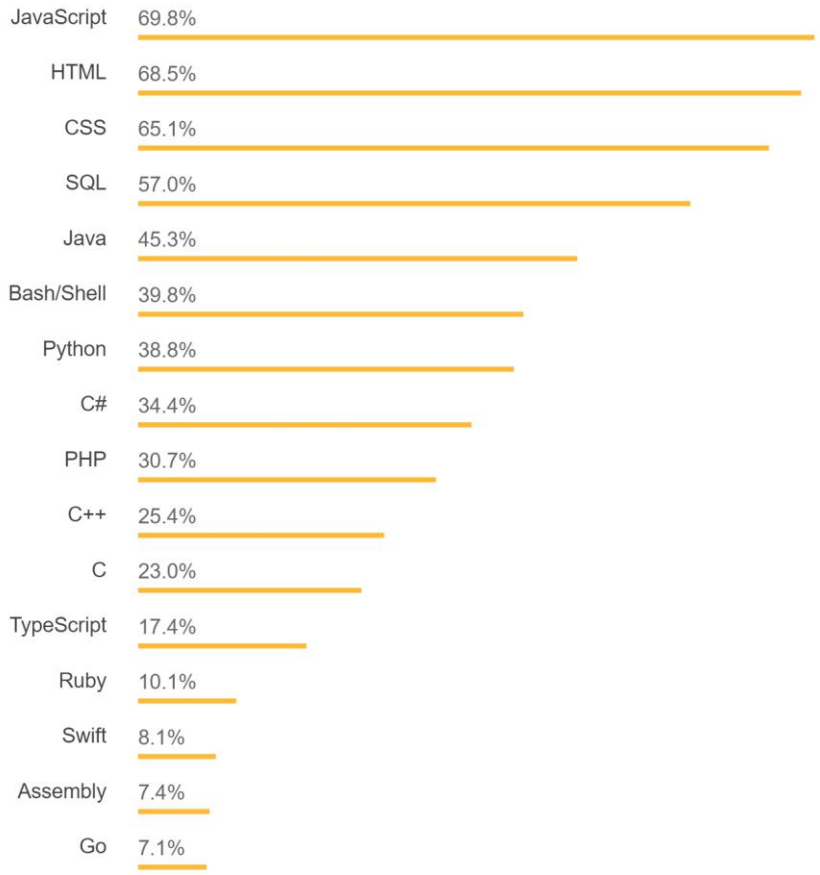
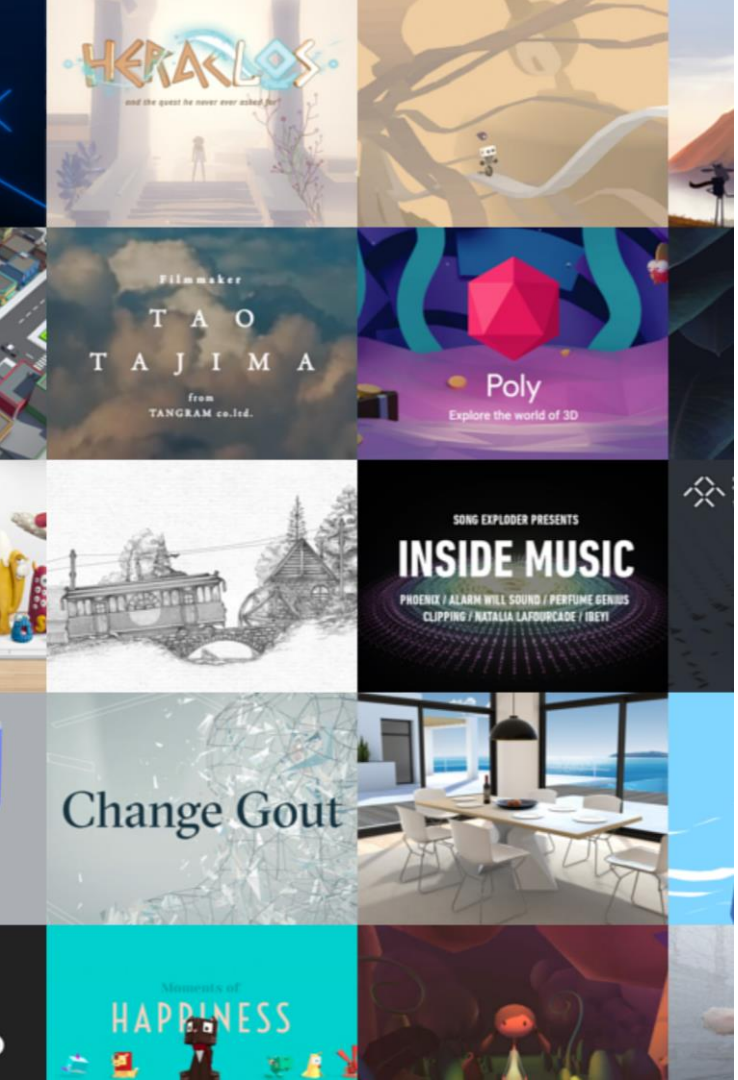


Too Long; Didn’t Listen:

- WebVR is ready!
- Simple Scenes, Interactions
- Examples in Video, Art, Education
- Three.js to A-Frame: Domain Data
- Data Pipelines

Stack Overflow Survey 2018





3D in the Web

WebGL

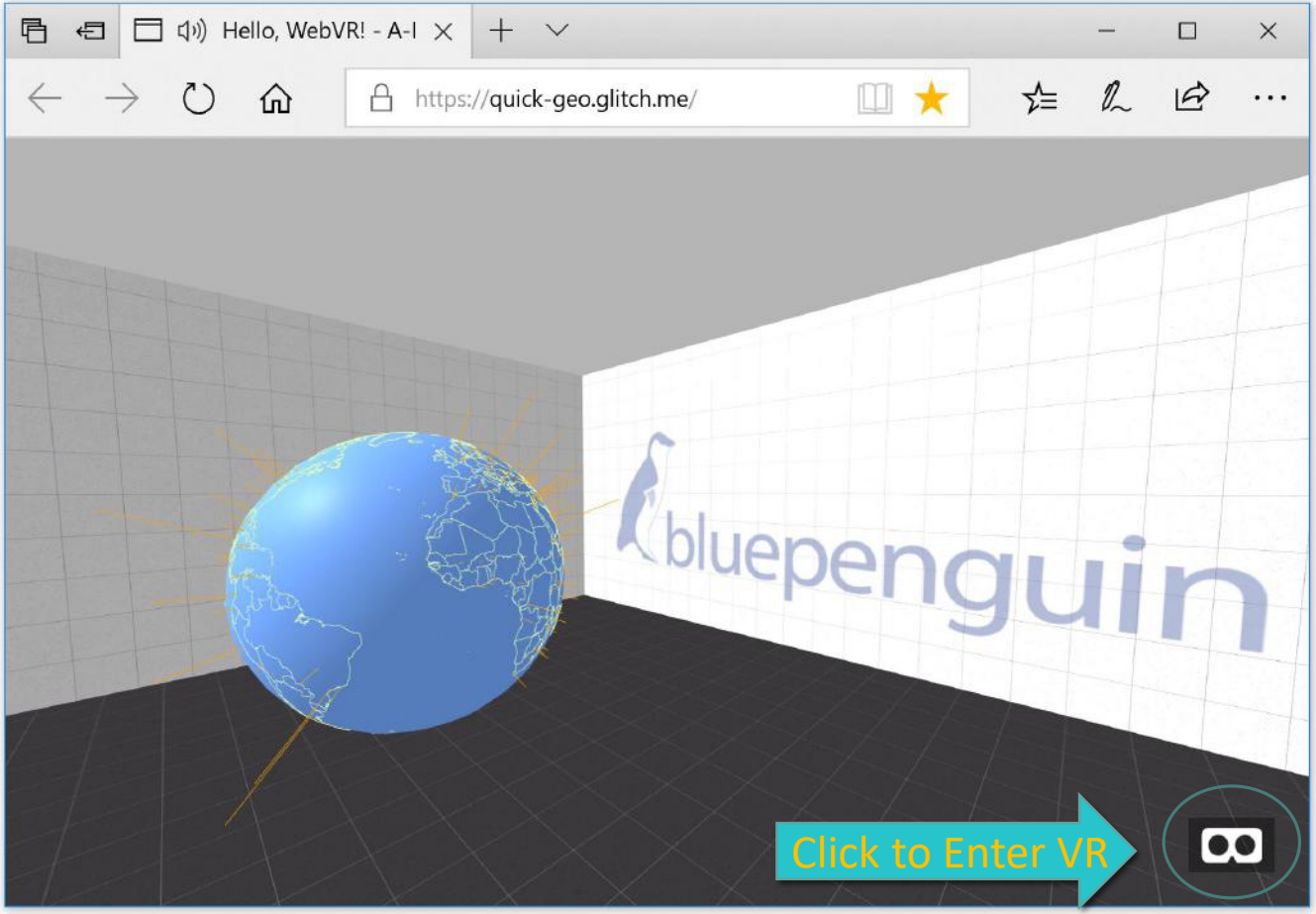
- JavaScript API for rendering interactive 2D and 3D graphics inside HTML <canvas> element

Three.js

- 3D JavaScript Library
- Uses WebGL, <canvas>, <svg>, CSS3D
- Scenes, Cameras, Geometry, Lights, Materials, Shaders, Animation…

WebXR

- Simple Access: navigate to URL and enter VR or AR
- **Unity** and **Unreal** Game Engines are extremely powerful, but may not always be the right tool
- Focus on **A-Frame** for composability and low barrier to entry



A-Frame

VR Made Simple: Just drop in a <script> tag and <a-scene>. A-Frame will handle 3D boilerplate, VR setup, and default controls. Nothing to install, no build steps.

Declarative HTML: HTML is easy to read, understand, and copy-and-paste. Being based on top of HTML, A-Frame is accessible to everyone: web developers, VR enthusiasts, artists, designers, educators, makers, kids.

Cross-Platform VR: Build VR applications for Windows Mixed Reality, Daydream, Vive, Rift, GearVR, and Cardboard with support for all respective controllers. Don’t have a headset or controllers? Works on standard desktop and smartphones.

A-Frame

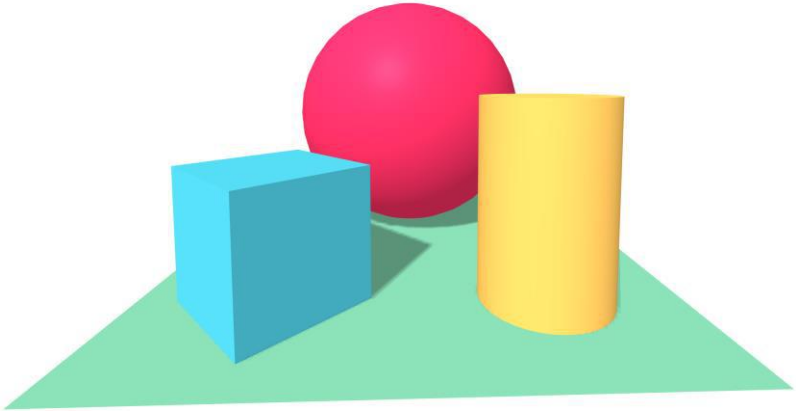
Entity-Component Architecture: A-Frame is a powerful three.js framework, providing a declarative, composable, reusable entity-component structure. HTML is just the tip of the iceberg; developers have unlimited access to JavaScript, DOM APIs, three.js, WebVR, and WebGL.

Performance: A-Frame is optimized from the ground up for WebVR. While A-Frame uses the DOM, its elements don't touch the browser layout engine. 3D object updates are all done in memory with little overhead under a single requestAnimationFramecall. For reference, see A-Painter, a Tilt Brush clone built in A-Frame that runs like native (90+ FPS).

Tool Agnostic: Since the Web was built on the notion of HTML, A-Frame is compatible with most libraries, frameworks, and tools including React, Preact, Vue.js, d3.js, Ember.js, jQuery.
Visual Inspector: A-Frame provides a handy built-in visual 3D inspector. Open up any A-Frame scene, hit <ctrl> + <alt> + i, and fly around to peek under the hood!

A-Frame

Simple Scene: https://glitch.com/edit/#!/prickle-stove?path=index.html



Example: Video

https://glitch.com/edit/#!/go-video?path=index.html:91:41

A-Frame – Interactions

```html
<a-entity tracked-controls="controller: 0; idPrefix: OpenVR"></a-entity>
```

```html
<a-entity windows-motion-controls="hand: left"></a-entity>
<a-entity windows-motion-controls="hand: right"></a-entity>
```

Event Name	Description
thumbstickdown	Thumbstick button pressed.
thumbstickup	Thumbstick button released.
thumbstickchanged	Thumbstick button changed.
thumbstickmoved	Thumbstick axis moved.
triggerdown	Trigger pressed.
triggerup	Trigger released.

```
<script>

AFRAME.registerComponent('control_movement', {

    init: function () {
        this.TRIGGER_EVENT = 'triggerdown'
        this.el.addEventListener(
            this.TRIGGER_EVENT, e => this.startTrigger(e))
    },

    startTrigger: function (evt) {
        this.triggered = true;
      …
    }
}

</script>
```

Example – Personal Pages

Simple Scene: https://mesquite-sailor.glitch.me/

Example - Education

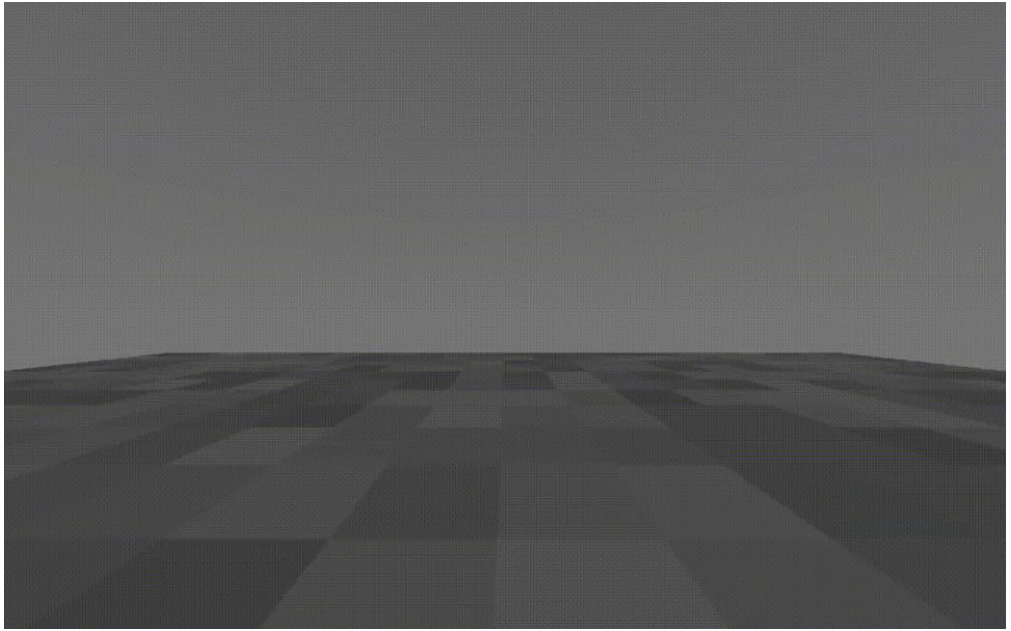
Simple Scene: https://vet-pad.glitch.me/

Many Components

Networking components for cross-device multi-user collaboration, e.g. Mozilla Hubs

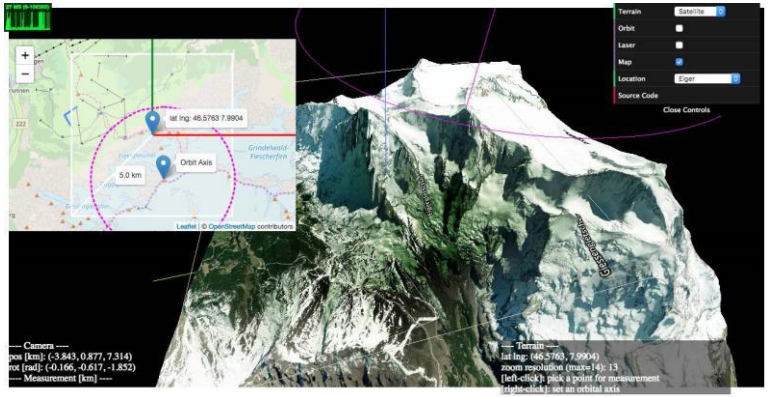
Animation system components and artistic post-processing components, enhancing the quality of visual explanations

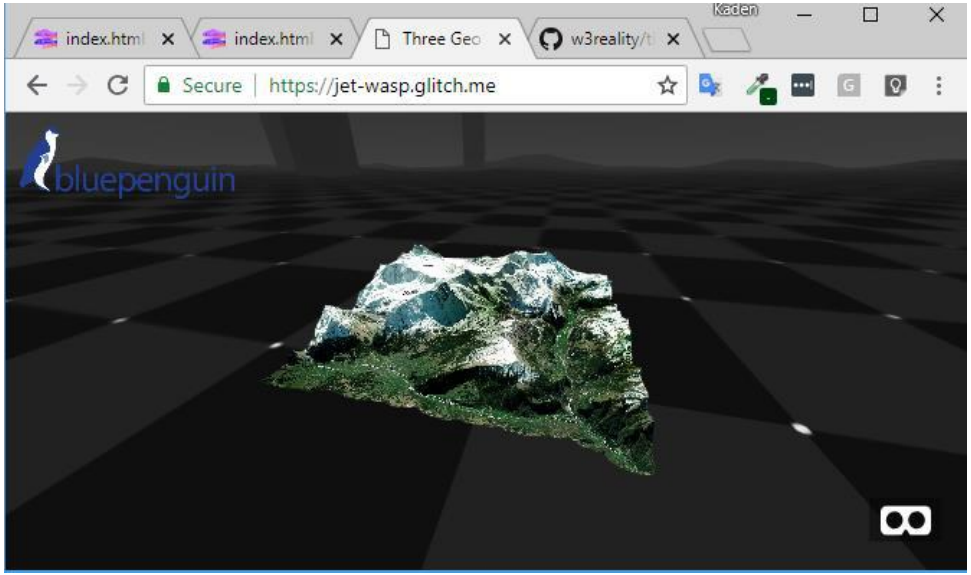
Virtual video capture and export, as well as recording of full 3D motion capture with Aframe Motion Capture component



Porting Three.js to A-Frame

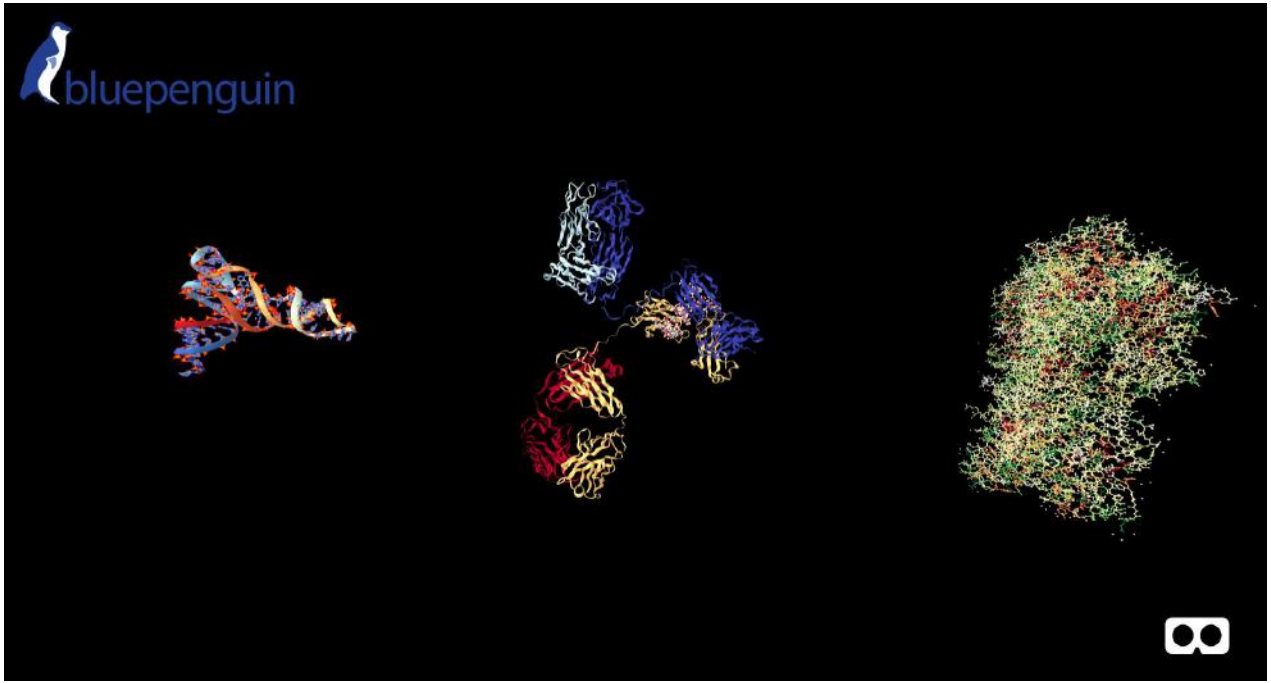
https://github.com/w3reality/three-geo
https://glitch.com/edit/#!/jet-wasp?path=index.html





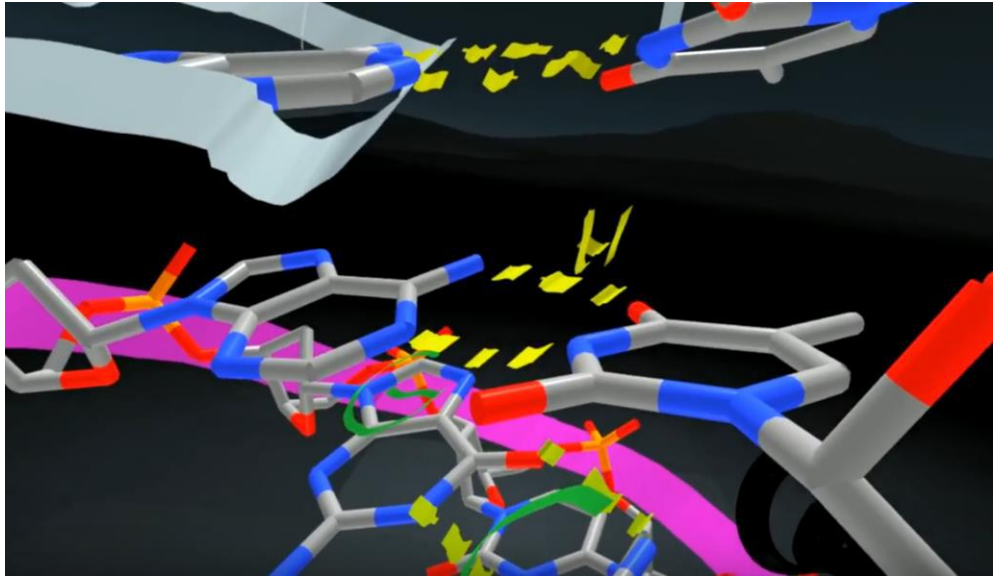
Porting Three.js to A-Frame

https://glitch.com/edit/#!/a-ngl?path=README.md



Mix & Match:
Chemical Visualization + 3D Painting

A-Painter Video: https://www.youtube.com/watch?v=QNaBCzfY72g



Data Processing

Data Processing

- Local + Cloud

Windows

Mac

amazon web services

Azure

Web Interface

HTML

JS JavaScript

d3.js

WebRTC

GeoJSON

Immersive Views

- VR/AR, Desktop, Tablet

Daydream

Microsoft HoloLens

oculus

magic leap

iOS

Technical Trend Alignment

- Edge Computing – AI & GPU for every computer
- Powerful Web Rendering (WebGL, Three.js, Web Assembly)
- Scalable Server Systems (Cloud, AWS)

Links

Links (click the 'Show Live' button to view):
Basic scene: https://glitch.com/edit/#!/prickle-stove?path=index.html:1:15
360 Video with Annotation: https://glitch.com/edit/#!/go-video?path=index.html:3:8
Art Gallery: https://mesquite-sailor.glitch.me/
Veterinary Model: https://glitch.com/edit/#!/vet-pad?path=index.html:1:15
GIS Data: https://glitch.com/edit/#!/jet-wasp?path=index.html
3 Chemicals Example: https://a-ngl.glitch.me/
Chemical move & scale with WMR Controllers: https://precious-cell.glitch.me/
Amino Acids Poster, with controls for Oculus Go: https://amino-go.glitch.me/

Extra Video:
Amino Acids in HoloLens: https://www.youtube.com/watch?v=opA2NagU-9A