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thanks for input from
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Rob Manson @BuildAR

AR DEVELOPMENT USING WEB TECHNOLOGY

AR Development: Perspective

- What is holding AR back?
  - Technology
    - Display hardware, large scale tracking and sensing, …
  - OS support
    - ***Simultaneous display of multiple application content***
    - ***Integration with existing app ecosystems (web, mobile, …)***
- Secondary
  - Technology refinements (better image tracking, …)
  - Services (world knowledge, discovery, POIs, …)
  - Data interchange

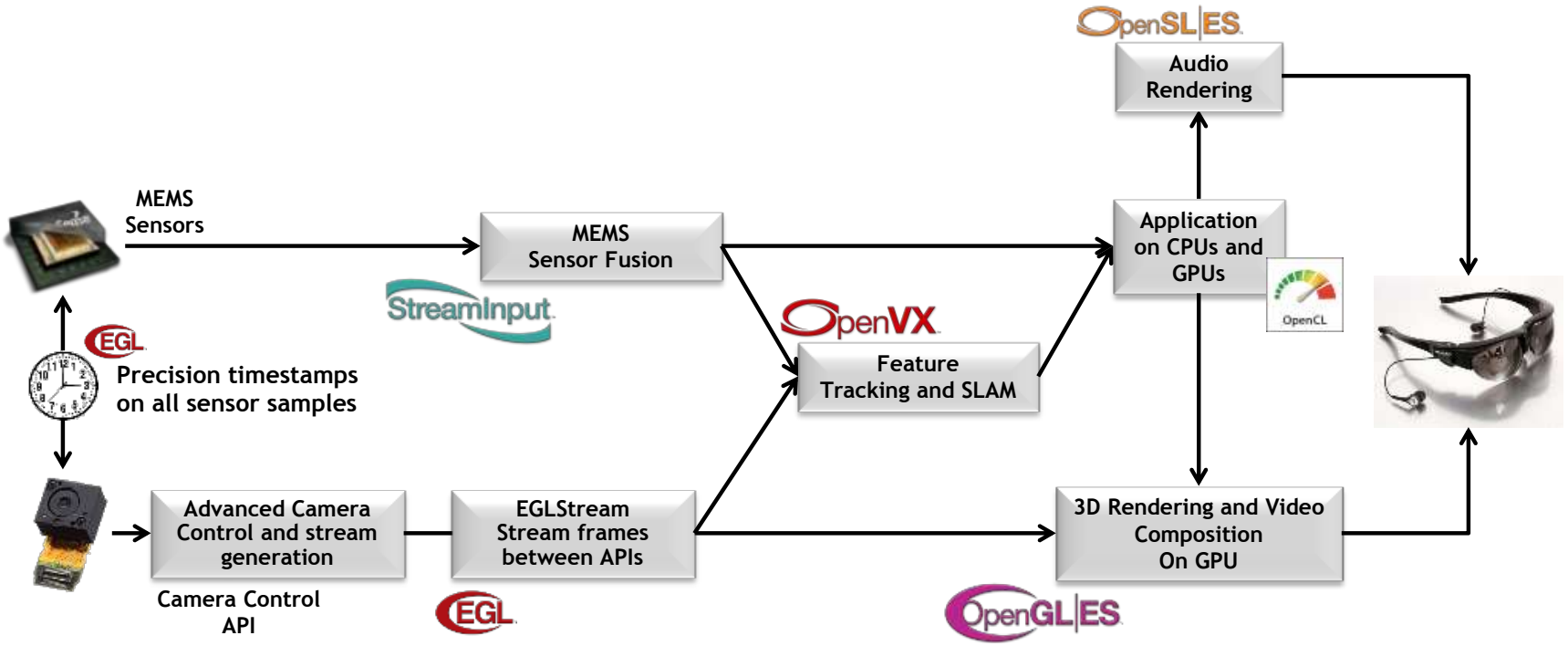
Argon: AR Web App Ecosystem

- Custom Web Browser for iOS
  - Video and panoramic backgrounds
  - Qualcomm Vuforia vision tracking
  - Mixed WebGL/CSS3 Content
  - *Multiple overlapping AR web apps*
  - *APIs and UI for multi-app coordination*
- *Research!*
- argon.js
  - Javascript APIs for AR app dev
  - Cross platform (not just Argon)
- Will be Open Source

GitHub

That said …
Enabling Technology is Improving

Khronos APIs for Augmented Reality



Web Technology is Also Improving

KHRONOS GROUP

WebCL WebGL

https://github.com/mrdoob/**three.js**

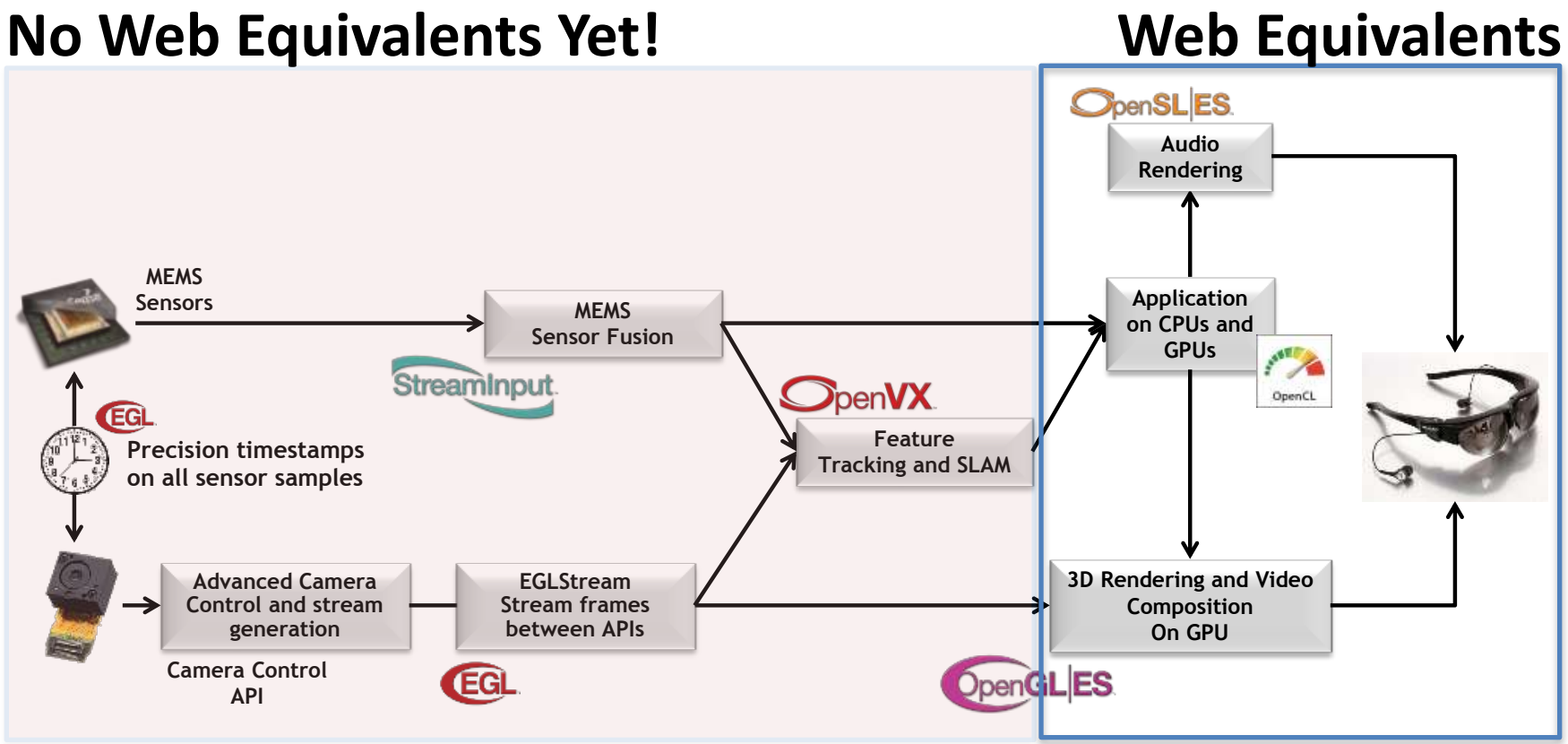
https://github.com/kig/**JSARToolKit**

W3C®

Geolocation
DeviceOrientation (devicemotion)
WebAudio
WebRTC (getUserMedia)

famo.us

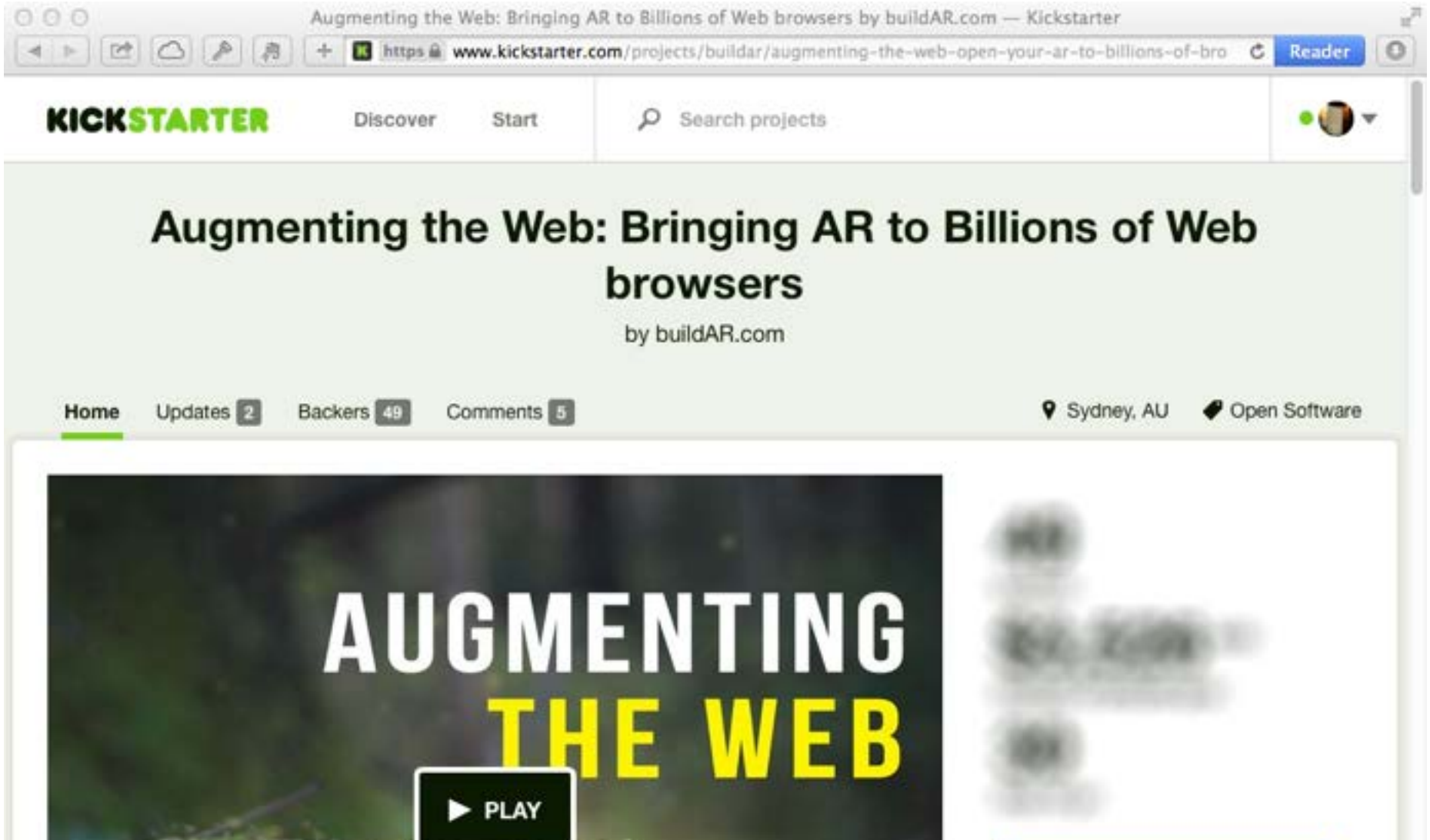
Web Still Has a Way To Go, But Almost There



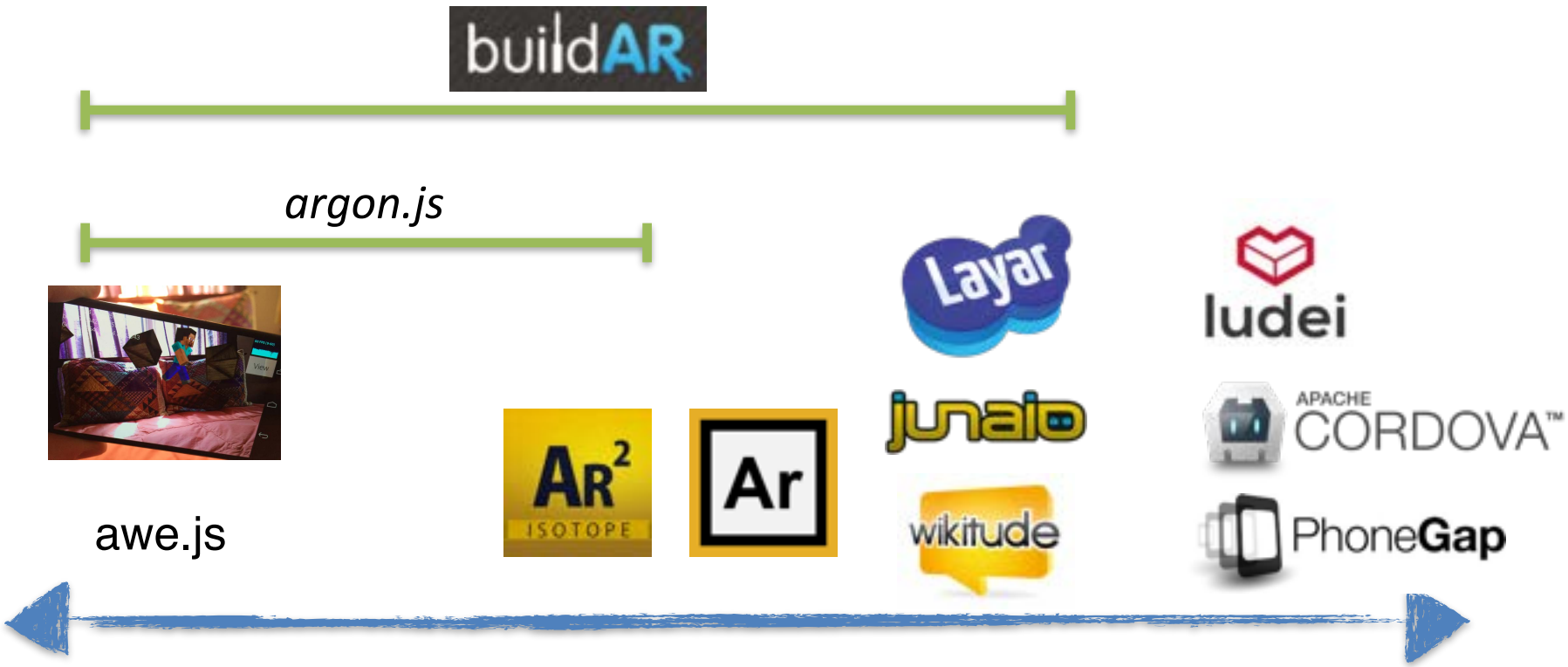
[Thanks to Ray Chen]

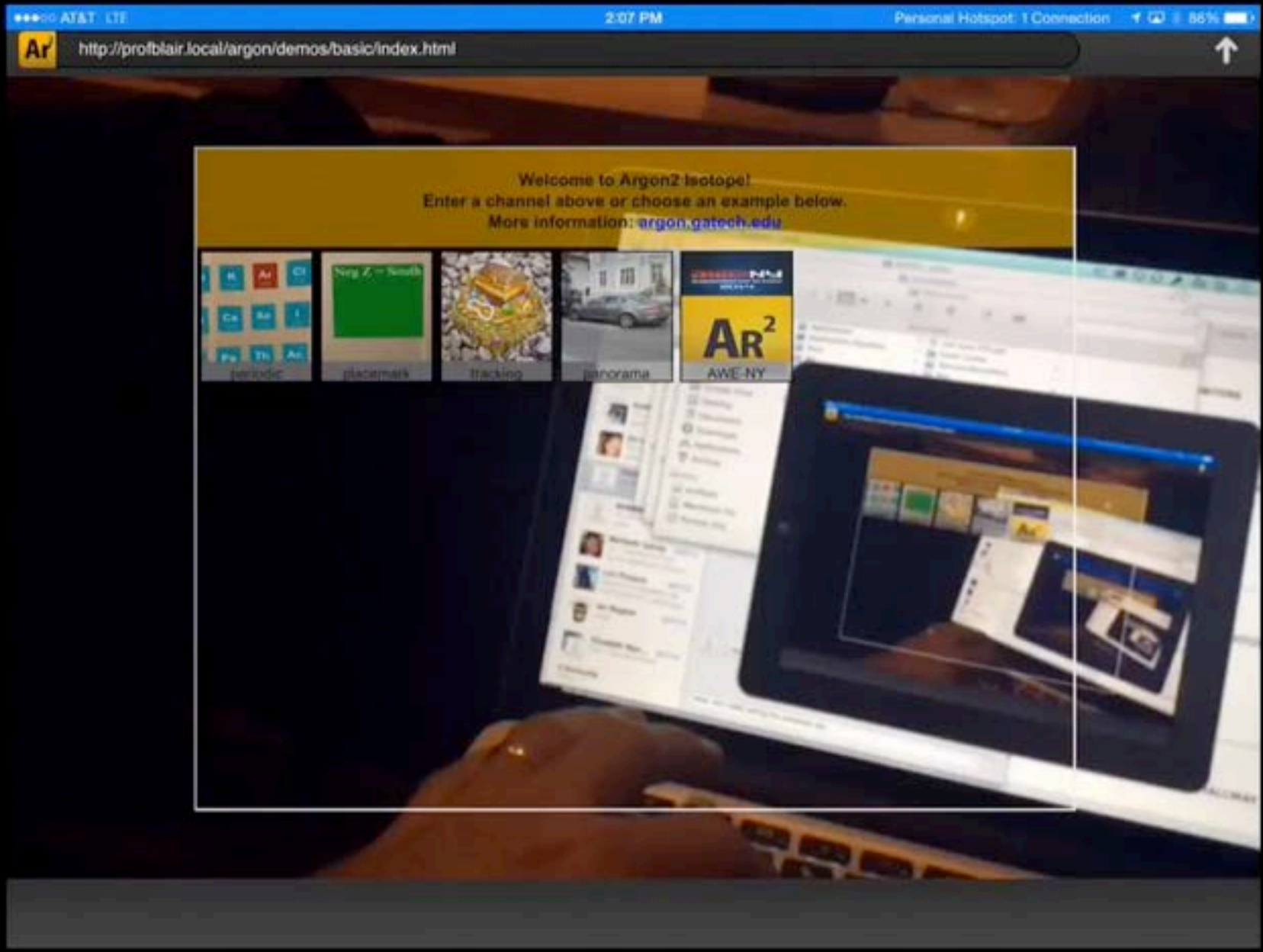
awe.js (from BuildAR)

https://www.kickstarter.com/projects/buildar/augmenting-the-web-open-your-ar-to-billions-of-bro



Spectrum of Web Technology in AR




AT&T LTE
2:07 PM
Personal Hotspot: 1 Connection
86%
http://profblair.local/argon/demos/basic/index.html
Welcome to Argon2 Isotope!
Enter a channel above or choose an example below.
More information: argon.gatech.edu
Neg Z = South
placemark
tracking
panorama
AR2
AWE-NY

```
<!doctype html>
<html lang="en">
    <head>
        <title>Argon Basic AR Web App</title>
        <link rel="apple-touch-icon" href="assets/sample_icon_57x57.png" />
        <meta charset="utf-8">
        <meta name="viewport" content="width=device-width, user-scalable=no, minimum-scale=1.0, maxi
        <meta name="arenabled" />
        <script>
            var myAppController =
            {
                geoObject : null,
                cube : null,

                createContent : function()  // put a yellow cube 0.001 degrees south of us
                {…},

                onArgonReady : function()
                {
                    myAppController.createContent();
                    ARGON.loadDataset("http://argon.gatech.edu/demos/basic/StonesAndChips.xml");
                },

                onDataSetLoaded : function(event)  // put a red cube and red div on the target
                {…}
            };

            document.addEventListener("AR.DataSetLoadedEvent", myAppController.onDataSetLoaded);
            document.addEventListener("AR.ArgonReadyEvent", myAppController.onArgonReady);

        </script>
    </head>
    <body>
        <script src="http://argon.gatech.edu/argon.js"></script>
    </body>
</html>
```

```
createContent : function()  // put a yellow cube 0.001 degrees south of us
{
    var cubeGeometry, cubeMaterial;
    cubeGeometry = new THREE.CubeGeometry(100, 100, 100, 2, 2, 2);
    cubeMaterial = new THREE.MeshLambertMaterial({ color: 0xFFFF00, shading: THREE.FlatShading,
                                                   overdraw: true });

    cube = new THREE.Mesh( cubeGeometry, cubeMaterial );
    cube.position.x = 0;
    cube.position.y = 0;
    cube.position.z = 0;
    cube.scale.x = 10;
    cube.scale.y = 10;
    cube.scale.z = 10;
    cube.rotation.y = 45.0;
    cube.rotation.x = 10.0;

    var lla = ARGON.geolocation.lla;
    geoObject = ARGON.createGeoObject(lla.latitude - 0.001, lla.longitude, lla.altitude);
    geoObject.add( cube );

    ARGON.World.add( geoObject );
},
```

```
onDataSetLoaded : function(event)  // put a red cube and red div on the target
{
    var dataset, stonesTarget, trackedObject;
    var redCube, redMaterial, redGeometry;

    dataset      = event.dataset;
    stonesTarget = dataset.targets["stones"];

    if (stonesTarget)
    {
        trackedObject        = new ARGON.TrackedObject();
        trackedObject.name   = "AttachedToStonesTarget";

        trackedObject.autoHideAfterFrames = 1;
        trackedObject.setTarget( stonesTarget );

        redGeometry = new THREE.CubeGeometry(100, 100, 100, 2, 2, 2);
        redMaterial = new THREE.MeshLambertMaterial({ color: 0xFF0000, shading: THREE.FlatShading, overdraw: true });
        redCube = new THREE.Mesh( redGeometry, redMaterial );
        redCube.position.z = 50.0;

        var divEl = document.createElement('div');
        divEl.id = "cssContent";
        divEl.style.width = "100px";
        divEl.style.height = "100px";
        divEl.style.backgroundColor = "red";
        divEl.style.position = 'absolute';
        divEl.style.fontSize = "16px";
        divEl.innerText = "AR + HTML5";

        var cssObject;
        cssObject = new THREE.CSS3DObject(divEl);
        cssObject.width = 100;
        cssObject.height = 100;
        cssObject.position.x = 0.0;
        cssObject.position.y = 0.0;
        cssObject.position.z = 50.0;
        cssObject.visible = false;

        redCube.add(cssObject);

        trackedObject.add( redCube );
    }
}
```

Web page with AR in s

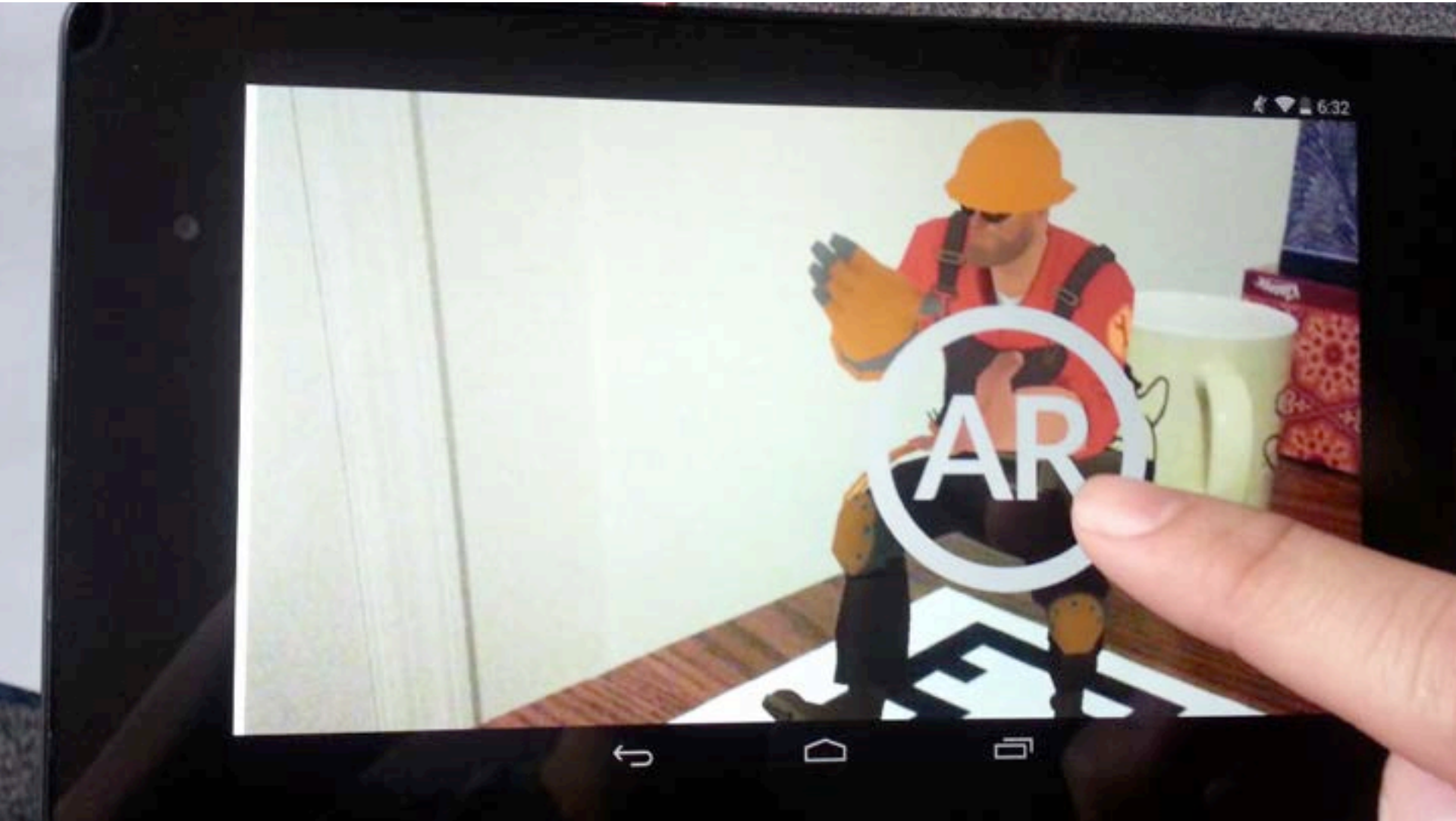
(Chrome on Android, Nexus 7)

(Thanks to Ray Chen)

Embedded Vision-based AR

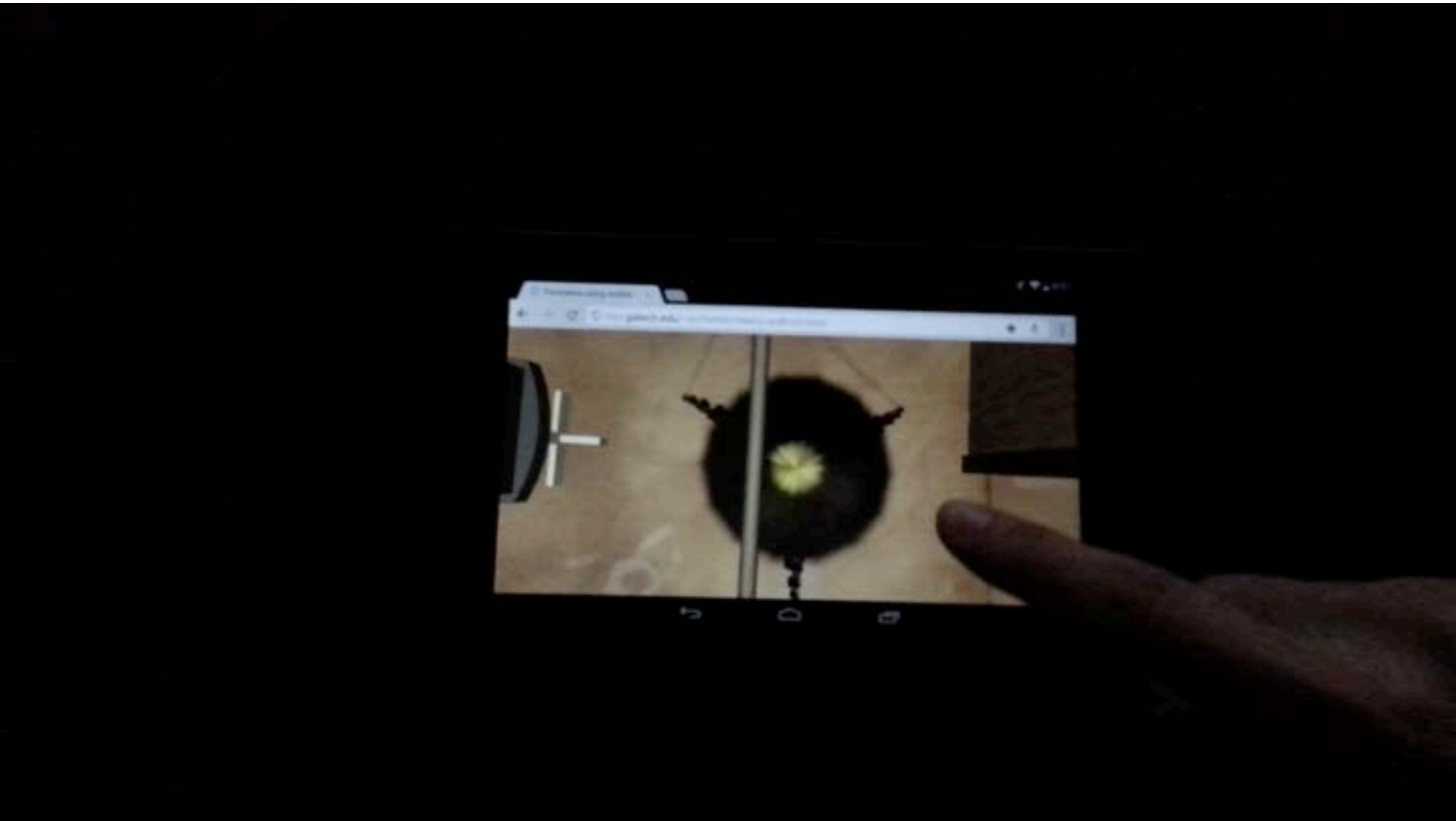
(using JSARToolkit, slow on mobile!)

(Thanks to Ray Chen)



AR in WebGL Panorama (same app)

(Thanks to Ray Chen)



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Information about the Argon project

http://argon.gatech.edu

Argon2 Isotope in the iOS app store

THANKS!