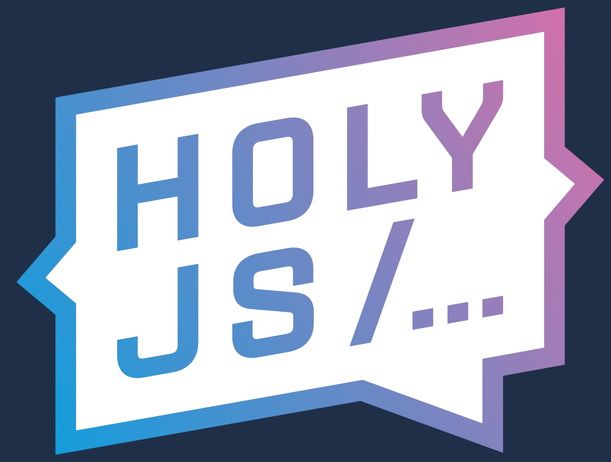
Bringing Mixed Reality to the Web

Marko Letic - AVA

@NisamProgramer



ABOUT ME

- Front End Engineer @AVA
- PhD student @FTN
- Lecturer at @Dafed https://dafed.org/
- Book reviewer @Manning specialized in JS related topics
- JS enthusiast

AGENDA

History

How did we end up here

WebGL and Three.js

Code examples

VS Code + plugins

Opening 3D models in IDE

Importing 3D models

Adding external models to the scene

Creating VR Scene

Using A-Frame

Creating AR scene

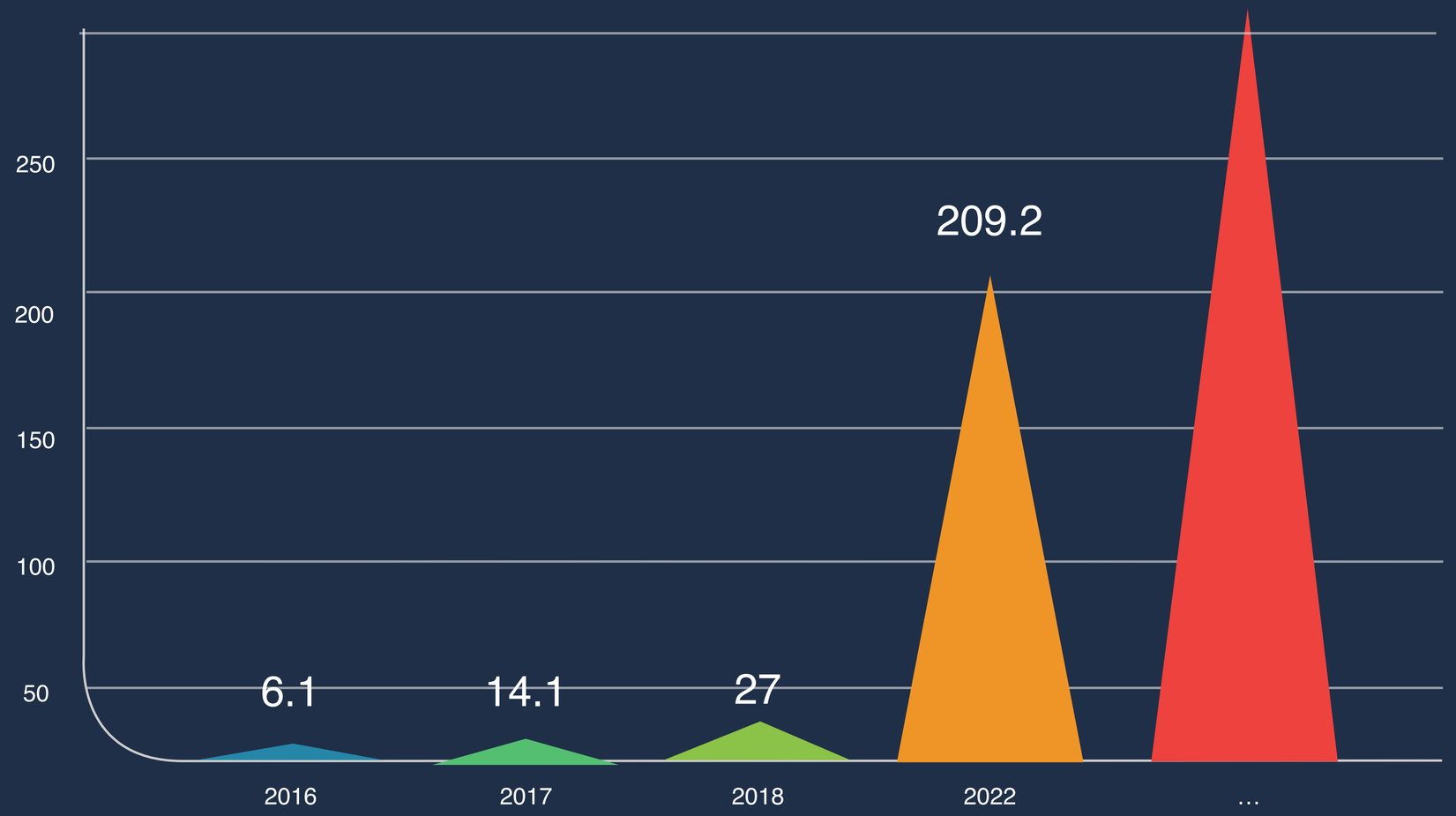
Using AR.js

WebXR

Where we are going

Statistics

- Forecast augmented (AR) and virtual reality (VR) market size worldwide from 2016 to 2022 (in billion U.S. dollars) - statista.com



Skills and tools

- Elementary JavaScript knowledge with HTML and CSS
- GitHub https://github.com/mletic/web-mixed-reality/
- Visual Studio Code with plugins (other IDE are fine too - Sublime, Atom…)
- Chrome browser with Chrome developer tools
- Node.js + http-server
  https://www.npmjs.com/package/http-server

History - WebGL

- **WebGL** (**Web Graphics Library**) is a JavaScript API for rendering interactive 2D and 3D graphics within any compatible web browser without the use of plug-ins

- Allowing GPU-accelerated usage of physics and image processing and effects as part of the web page canvas

- 2006. - WebGL evolved out of the Canvas 3D experiments started by Vladimir Vukićević at Mozilla

- 2009. - Khronos Group started WebGL Working Group

- 2011. - Version 1.0 WebGL specification

- 2017. - WebGL 2 (based on OpenGL ES 3.0)

- 2018. - Supported in all major browsers - both desktop and mobile

History - Three.js

- **Three.js** allows the creation of GPU-accelerated 3D animations using the JavaScript language as part of a website without relying on proprietary browser plugins

- Three.js uses WebGL

- 2010. - First released by Ricardo Cabello to GitHub

- 2018. - r96 stable release (over 900 contributors on GH)

Example 1

- Demonstrating basic usage of Three.js
- Creating a simple cube that rotates
- link: https://github.com/mletic/web-mixed-reality/tree/master/example1

Example 2

- Importing 3D model (.obj + .mtl filest) to the Three.js scene
- Using VS Code + 3D Viewer for VSCode
- Running http-server
- link: https://github.com/mletic/web-mixed-reality/tree/master/example2

A-Frame

- Web framework for building virtual reality (VR) experiences
- Originally from Mozilla
- Easy way to develop VR content
- Supports: Vive, Rift, Windows Mixed Reality, Daydream, GearVR, Cardboard…
- Based on Three.js -> full access to the API

A-Frame

- VR Made Simple
- Declarative HTML
- Cross-Platform VR
- Entity-Component Architecture
- Performance
- Tool Agnostic

Example 3

- Basic A-Frame scene
- Elements on a plane with a sky
- Basic manipulation
- Working with the Visual Inspector
  ctrl+alt+i (mac: control+option+i)
- Run it on your phones!
- link: https://github.com/mletic/web-mixed-reality/tree/master/example3

Example 4

- A-Frame scene with imported assets (3D model)
- Position the camera if the element is too close
- Run it on your phones!
- link: https://github.com/mletic/web-mixed-reality/tree/master/example4

AR.js

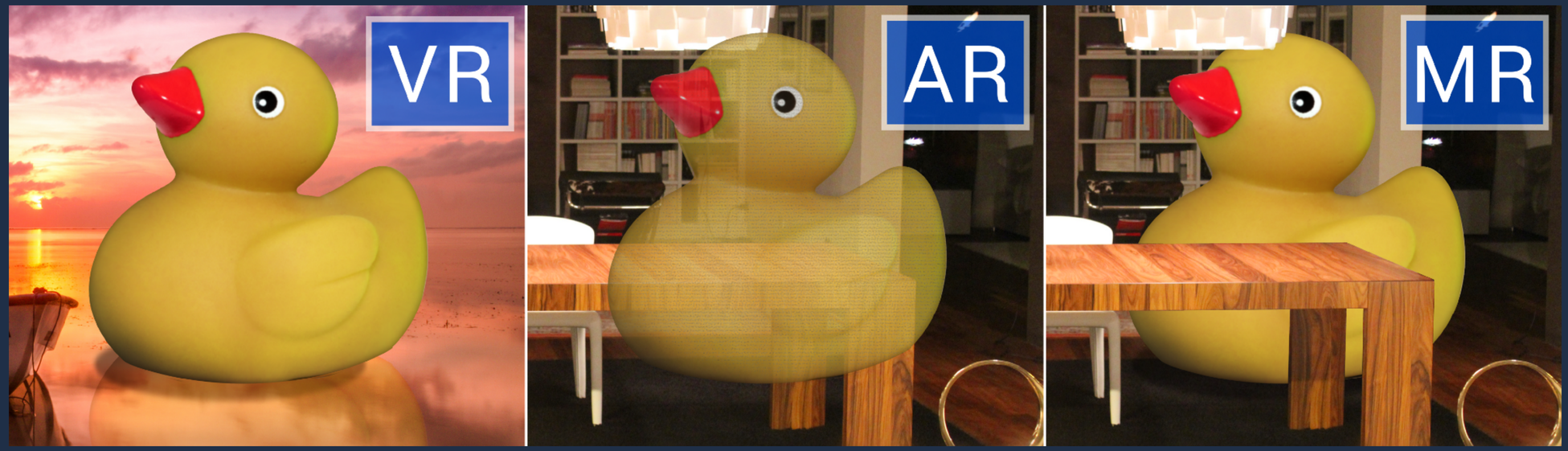
- Augmented reality for the web
- aframe + three.js + jsartoolkit5
- Works on any phone with webgl and webrtc (minor iOS issues)
- All open source

Example 5

- AR.js scene with a texture as asset
- Casting the element on a surface template image
- Run it on your phones!
- link: https://github.com/mletic/web-mixed-reality/tree/master/example5


Hiro

Differences between VR, AR & MR



WebXR

- API for accessing virtual reality (VR) and augmented reality (AR) devices, including sensors and head-mounted displays, on the Web
- Name change: WebVR -> WebXR
- https://immersive-web.github.io/webxr/
- XR refers to hardware, applications, and techniques used for Virtual Reality, Augmented Reality, and other related technologies
  - Head mounted displays, whether they are opaque, transparent, or utilize video passthrough
  - Mobile devices with positional tracking
  - Fixed displays with head tracking capabilities

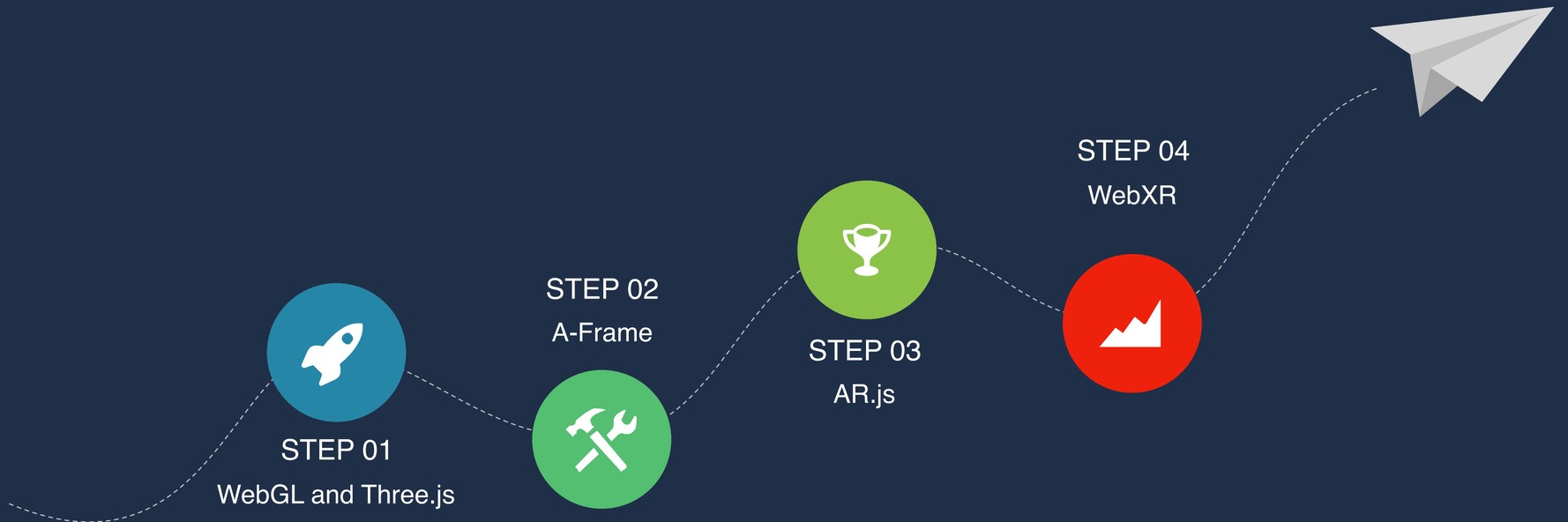
2017

- Mozilla shipped the WebVR API in Firefox
- Oculus browser and Samsung Internet shipped WebVR for Gear VR
- Microsoft is shipping WebVR in Edge
- VR frameworks like A-Frame and ReactVR gained massive popularity
- VR tools expansion: Vizor, WebVR Studio, PlayCanvas…

2018

- WebVR -> WebXR
- Providing access to both augmented and virtual reality devices
- Immersive Web Community Group
- WebXR viewer for iOS
- …

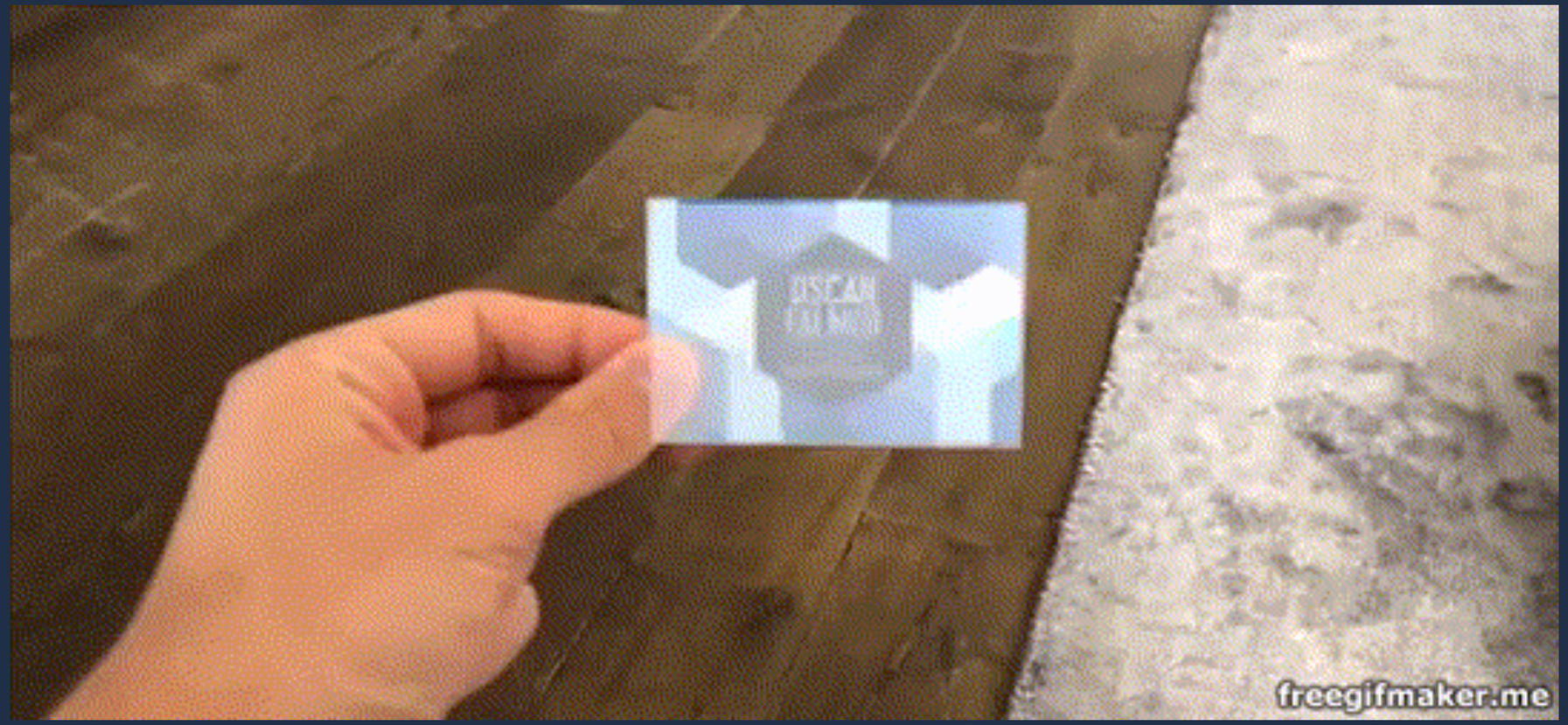
Road we travelled



Mozilla A-Painter on WebXR

Moving and rotating a WebAR model using Google's Article 3D model viewer

More examples…



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THANK YOU!