A virtual tour to

Augmented and Virtual Reality

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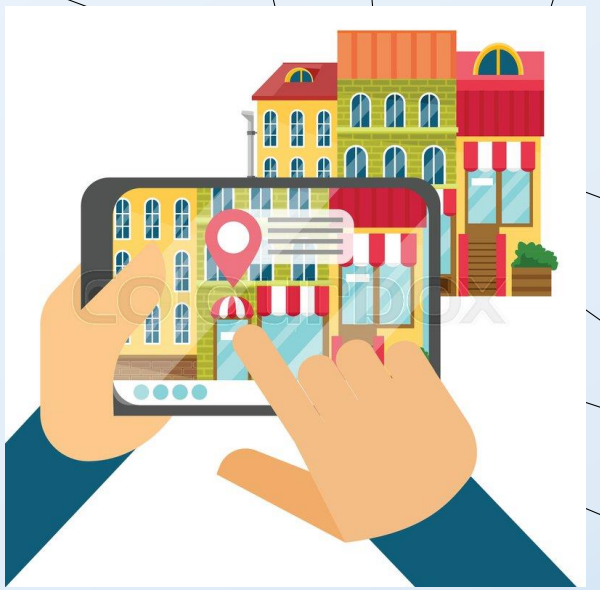
Agenda

- A-Frame: Introduction, Installation
- AR/VR Handsets, Web VR Browsers
- Basic Primitives and HTML attributes

Write AR.js app once and run on all platforms



Underneath, A-Frame is an entity-component framework for three.js that is exposed declaratively.

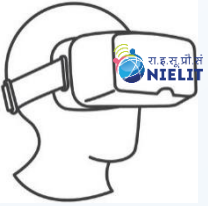
References

Websites :

- developers.google.com/ar,
- dev.to/arunkumarvallal, mobidev.biz, gerardfriel.com/ar/the-history-of-ar
- Harvard Business Review – *"Managers-Guide-to-AR"*
- "Virtual Reality/Augmented Reality White Paper" CAICT, Huawei Technologies Co.

Books

- "Theory and applications of marker-based augmented reality" – Sanni Siltanen
- "Computer graphics"- Hearn and Baker

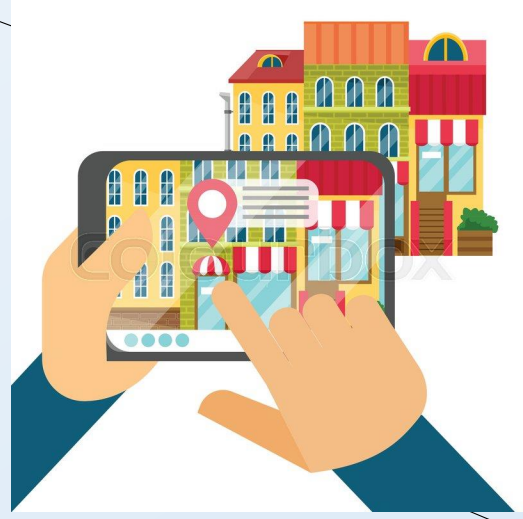


A-Frame — VR for the people

- The A-Frame framework was created in 2015 by the Mozilla VR team in order to allow web developers and designers to author 3D and VR experiences with HTML without having to know WebGL.
- A-Frame is based on HTML and the DOM, which makes it very accessible and easy to use.
- While using only the HTML layer allows getting an impressive result, HTML is only the outermost abstraction layer of A-Frame.
- **Underneath, A-Frame is an entity-component framework for three.js that is exposed declaratively.**

Source : https://blog.hololabs.io/building-ar-vr-with-javascript-and-html-97af4434bcf6

A-Frame

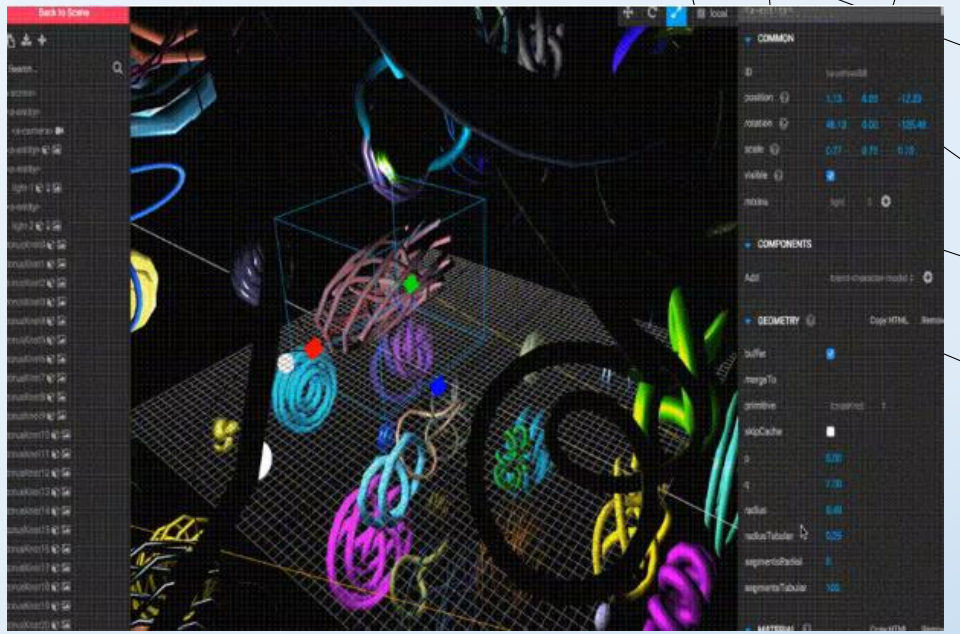


- A-Frame is an open-source web framework for building virtual reality (VR) experiences.
- It is maintained by developers from Supermedium (Diego Marcos, Kevin Ngo) and Google (Don McCurdy)
- A-Frame is an entity component system framework for Three.js where developers can create 3D and WebVR scenes using HTML.
- HTML provides a familiar authoring tool for web developers and designers while incorporating a popular game development pattern used by engines such as Unity.

Source : wikipedia.org

History

- A-Frame was originally developed within the Mozilla VR team during mid-to-late 2015.
- A-Frame was created in order to allow web developers and designers to author 3D and VR experiences with HTML without having to know WebGL.
- A-Frame's first public release was on December 16, 2015.
- There are now over 256 contributors in total.



Working

- 🅰-Frame is a web framework for building virtual reaslity (VR) experiences.
- A-Frame is based on top of HTML, making it simple to get started.
- But A-Frame is not just a 3D scene graph or a markup language; the core is a powerful entity-component framework that provides a declarative, extensible, and composable structure to **three.js**
- Originally conceived within Mozilla and now maintained by the co-creators of A-Frame within **Supermedium**, A-Frame was developed to be an easy yet powerful way to develop VR content.

Source : aframe.io

Features

- **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.
- **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.

Source : aframe.io

Features

- **Cross-Platform VR**: Build VR applications for Vive, Rift, Windows Mixed Reality, Daydream, GearVR, and Cardboard with support for all respective controllers. Don’t have a headset or controllers? No problem! A-Frame still works on standard desktop and smartphones.
- **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 garbage and overhead. The most interactive and large scale WebVR applications have been done in A-Frame running smoothly at 90fps.
- **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!

Source : aframe.io

Features

- **Components**: Hit the ground running with A-Frame's core components such as geometries, materials, lights, animations, models, raycasters, shadows, positional audio, text, and controls for most major headsets. Get even further from the hundreds of community components including environment, state, particle systems, physics, multiuser, oceans, teleportation, super hands, and augmented reality.
- **Proven and Scalable**: A-Frame has been used by companies such as Google, Disney, Samsung, Toyota, Ford, Chevrolet, Amnesty International, CERN, NPR, Al Jazeera, The Washington Post, NASA. Companies such as Google, Microsoft, Oculus, and Samsung have made contributions to A-Frame.

Online Code Editors

- **Glitch** provides an online code editor with instant deployment and hosting of web sites. The editor supports both front-end and back-end code as well as multiple files and directories. Glitch lets us remix (i.e., copy) existing projects and make them our own and instantly host and deploy changes for everyone to see
- glitch — aframe.glitch.me
- Mozilla Thimble — A-Frame
- CodePen — A-Frame

Practical – Hands on

```
<html>
 <head>
  <script src="https://aframe.io/releases/0.7.0/aframe.min.js"></script>
 </head>
 <body>
  <a-scene>
   <a-box> </a-box>
  </a-scene>
 </body>
</html>
```

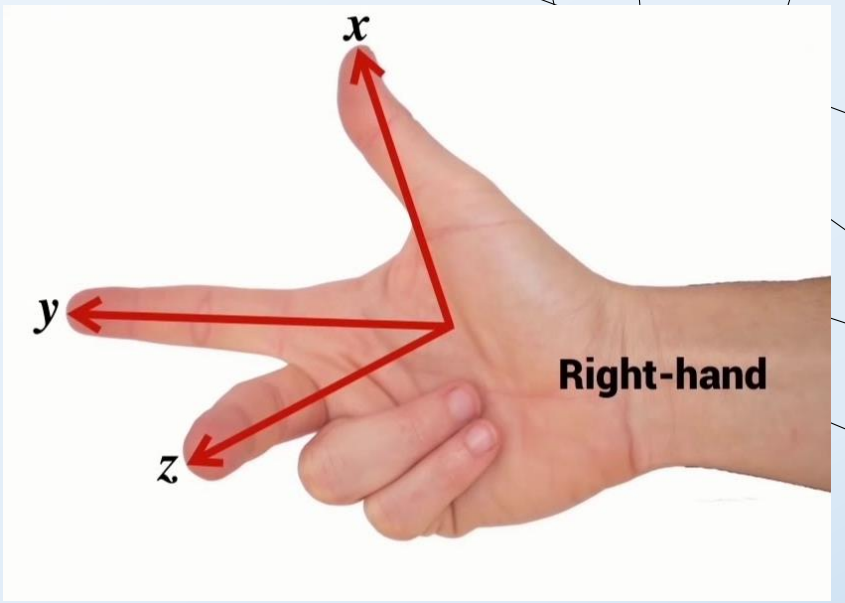
Keys :
W , A , S , D

Practical – Hands on

```
<a-scene>
    <a-box
        color="#00ff00"
        width="1"
        height="1"
        depth="1">
    </a-box>
</a-scene>
```

```
<a-scene>
    <a-cylinder
        color="#00ff00"
        radius="1"
        height="1"
        side="double"
        open-ended="true"
        >
    </a-cylinder>
</a-scene>
```

Right hand coordinate system



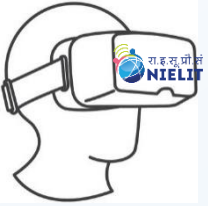
- A-Frame uses a right-handed **coordinate system where the negative Z axis extends into the screen**. The table below assumes looking down the negative Z axis from the origin. Negative X axis extends left. Positive X Axis extends right.

pos="x y z"

Axis	Description	Default Value
x	Negative X axis extends left. Positive X Axis extends right.	0
y	Negative Y axis extends down. Positive Y Axis extends up.	0
z	Negative Z axis extends in. Positive Z Axis extends out.	0

Relative Positioning

```
<a-scene>
        <! --  box – Parent Entity -- >
    <a-box
        color="#00ff00"     width="1"    height="1"   depth="1">
        <! --  circle – Child Entity -- >
        <a-circle side="double" position="0 0 1" >  0 0 0.11 ie 11 cms
        </a-circle>
        <a
    </a-box>
</a-scene>
```



Another circle

```
<a-scene>
        <! --  box – Parent Entity -- >
    <a-box
        color="#00ff00"      width="1"      height="1"     depth="1">
        <! --  circle – Child Entity -- >
        <a-circle side="double" position="0 0 1" >  0 0 0.11 ie 11 cms
        </a-circle>
        <a
    </a-box>
    <a-circle color="ffc107" side="double" position="-2 3 -6.89" ></a-circle>
    </a-circle>


</a-scene>
```