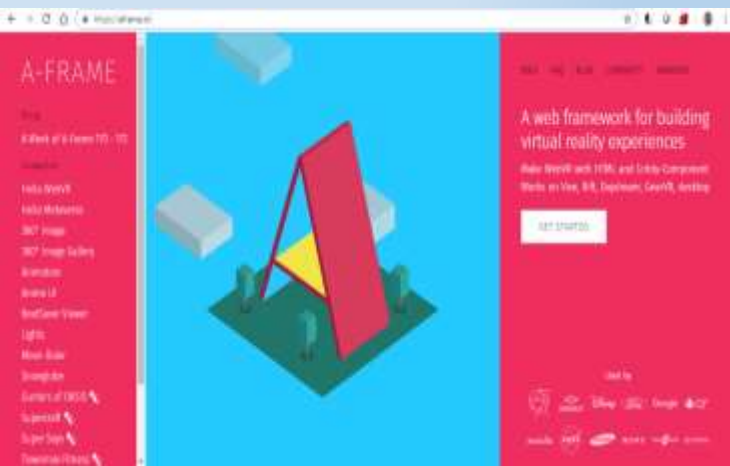# Augmented Reality
A-Frame

Dr. Sarwan Singh

NIELIT Chandigarh

https://aframe.io/

Agenda

- Introduction, History
- Usage
- A-frame features
- WebVR
- Three.js
- Best AR SDK an overview

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

Write AR.js app once and run on all platforms

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.**
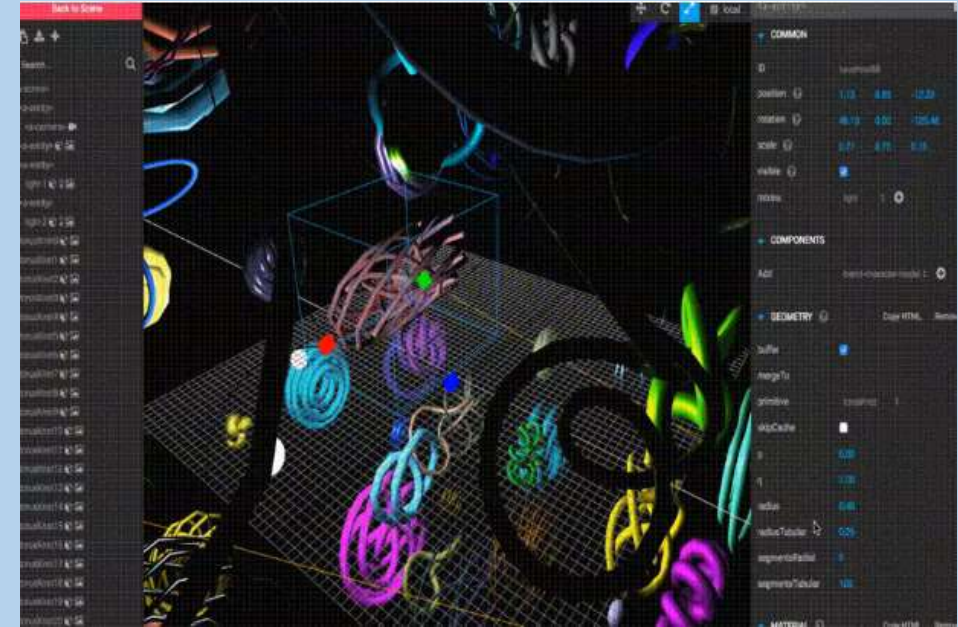
A-Frame

- 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

sarwan@NIELITchandigarh

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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.

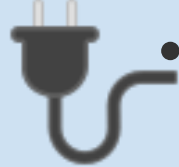- There are now over 256 contributors in total.

Working

- **A**-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

sarwan@NIELITchandigarh

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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

Three.js

- Three.js is a cross-browser JavaScript library and Application Programming Interface (API) used to create and display animated 3D computer graphics in a web browser.

- Three.js uses WebGL.

- The source code is hosted in a repository on GitHub.

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

History – three.js

- Three.js was first released by Ricardo Cabello to GitHub in April 2010.
- The origins of the library can be traced back to his involvement with the demoscene in the early 2000s.
- Javascript based WebGL was main contributing factor for publishing lot of content based on three.js on github
- Three.js runs in all browsers supported by WebGL 1.0.
- Three.js is made available under the MIT license

Feature of three.js

- Effects: Anaglyph, cross-eyed and parallax barrier.

- Scenes: add and remove objects at run-time; fog

- Cameras: perspective and orthographic; controllers: trackball, FPS, path and more

- Animation: armatures, forward kinematics, inverse kinematics, morph and keyframe

- Lights: ambient, direction, point and spot lights; shadows: cast and receive

- Materials: Lambert, Phong, smooth shading, textures and more

- Shaders: access to full OpenGL Shading Language (GLSL) capabilities: lens flare, depth pass and extensive post-processing library

- Objects: meshes, particles, sprites, lines, ribbons, bones and more - all with Level of detail

Feature of three.js

- Geometry: plane, cube, sphere, torus, 3D text and more; modifiers: lathe, extrude and tube

- Data loaders: binary, image, JSON and scene

- Utilities: full set of time and 3D math functions including frustum, matrix, quaternion, UVs and more

- Export and import: utilities to create Three.js-compatible JSON files from within: Blender, openCTM, FBX, Max, and OBJ

- Support: API documentation is under construction, public forum and wiki in full operation

- Examples: Over 150 files of coding examples plus fonts, models, textures, sounds and other support files

- Debugging: Stats.js, WebGL Inspector,[10] Three.js Inspector

- Virtual reality: accessing WebVR

WebVR

- WebVR is a JavaScript API for creating immersive 3D, virtual reality experiences in your browser. Or simply put, allows VR in the browser over the Web.

- A-Frame uses the WebVR API to gain access to VR headset sensor data (position, orientation) to transform the camera and to render content directly to VR headsets. Note that WebVR, which provides data, should not be confused nor conflated with WebGL, which provides graphics and rendering.

A-Frame Supports

- VR on desktop with a headset
- VR on mobile with a headset
- VR on standalone headset
- Flat on desktop (i.e., mouse and keyboard)
- Flat mobile (i.e., magic window)

- AR headsets (e.g., Magic Leap, HoloLens)
- mobile (i.e., magic window, ARKit, ARCore)

- A-Frame supports VR for any browser that implements the WebVR specification, and flat 3D for most browsers.

- Firefox, chrome, oculus, Microsoft edge, Samsung internet

VR Headset support
- HTC Vive
- Oculus Rift
- Oculus Quest
- Oculus Go
- Google Daydream
- Samsung GearVR
- Vive Focus ...

sarwan@NIELITchandigarh

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Building UIs

- https://aframe-building-ui.glitch.me/