Augmented and Virtual Reality

marker based AR using A-Frame

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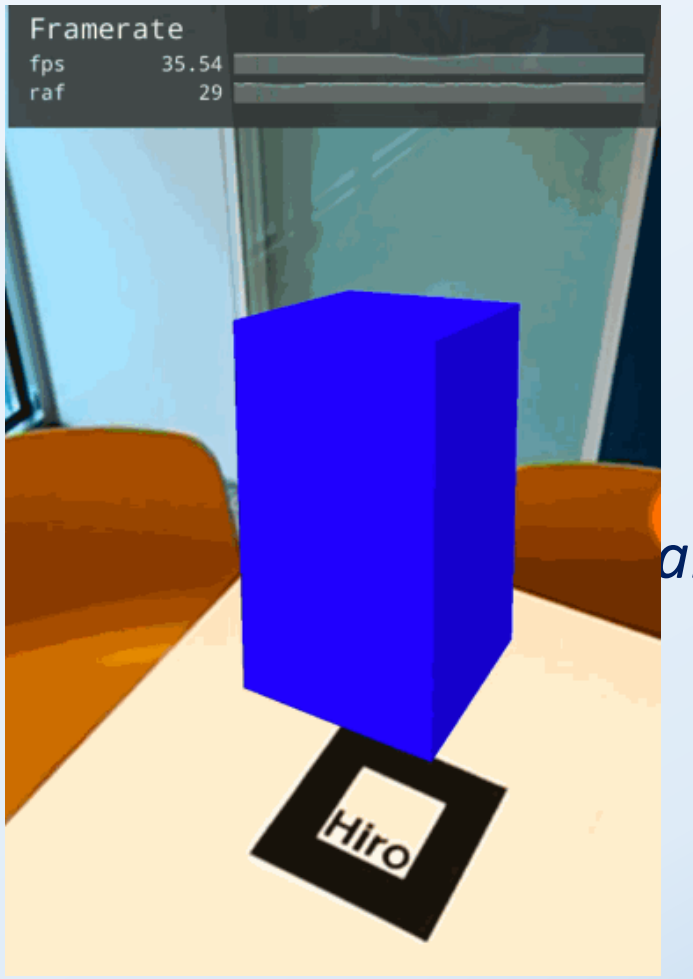
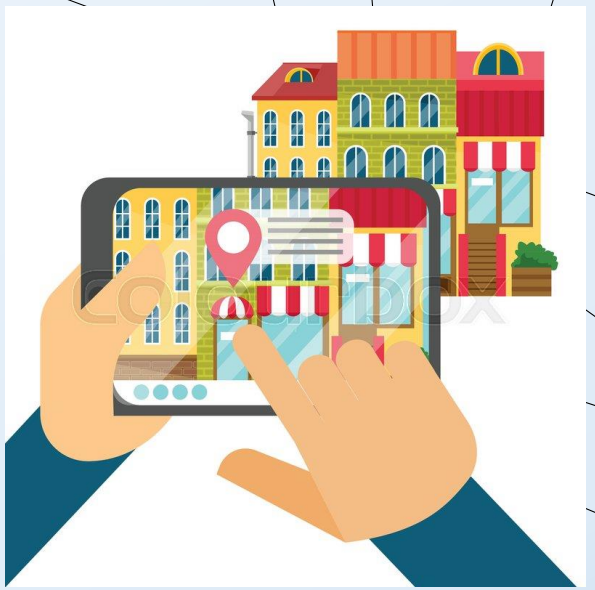
NIELIT Chandigarh

Agenda

- A-Frame: Marker
  - Hiro Marker
  - Custom marker



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

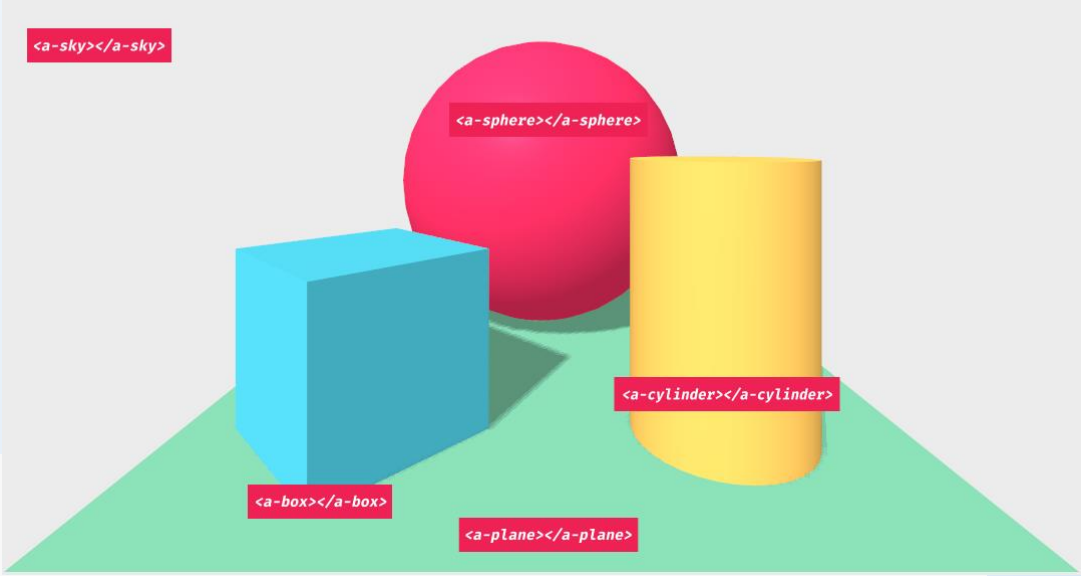
Websites :

- developers.google.com/ar,
- dev.to/arunkumarvallal, mobidev.biz, gerardfriel.com/ar/the-history-of-ar
- Aframe.io, theodo.com

Books

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

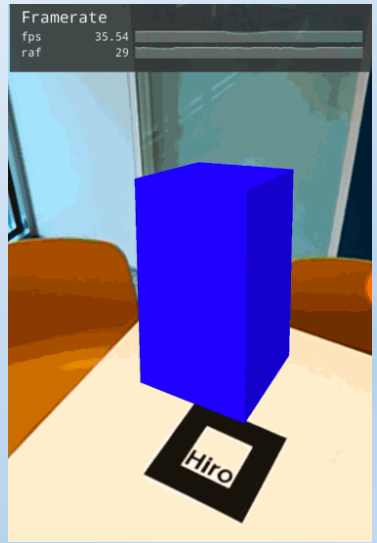
First code



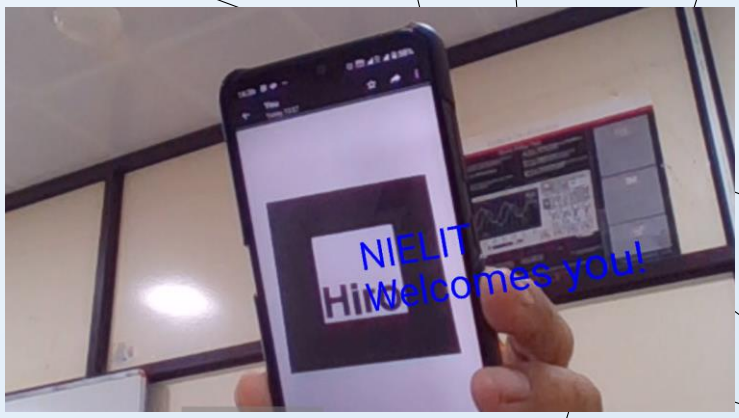

```
<html>
<head>
<script src="https://aframe.io/releases/0.9.2/aframe.min.js"></script>
</head>
<body>
   <a-scene>
      <a-box position="-1 0.5 -3" rotation="0 45 0" color="#4CC3D9"></a-box>
      <a-sphere position="0 1.25 -5" radius="1.25" color="#EF2D5E"></a-sphere
      <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="#FFC6
      <a-plane position="0 0 -4" rotation="-90 0 0" width="4" height="4" colo
      <a-sky color="#ECECEC"></a-sky>
    </a-scene>
</body>
</html>
```

Marker based AR

```
<html>
  <head>
  <script src="https://aframe.io/releases/0.6.1/aframe.min.js"></script>
  <script src="https://rawgit.com/donmccurdy/aframe-extras/master/dist/aframe-extras.loaders.min.js"></script>
  <script src="https://cdn.rawgit.com/jeromeetienne/AR.js/1.5.0/aframe/build/aframe-ar.js"></script>
  </head>
<body style='margin : 0px; overflow: hidden;'>
  <a-scene stats embedded arjs='trackingMethod: best;'>
    <a-marker preset="hiro">
     <a-box position='0 1 0' material='color: blue;'> </a-box>
    </a-marker>
    <a-entity camera></a-entity>
  </a-scene>
</body>
</html>
```



Practical – Hands on




```
<html>
  <head>
  <script src="https://aframe.io/releases/0.6.1/aframe.min.js"></script>
  <script src="https://rawgit.com/donmccurdy/aframe-extras/master/dist/aframe-extras.loaders.min.js"></script>
  <script src="https://cdn.rawgit.com/jeromeetienne/AR.js/1.5.0/aframe/build/aframe-ar.js"> </script>
  </head>
<body style='margin : 0px; overflow: hidden;'>
   <a-scene embedded arjs='sourceType: webcam;'>
     <a-text text="value: NIELIT \n Welcomes you!" color="blue"    rotation="-90 0 0"></a-text>
     <a-marker-camera preset='hiro'></a-marker-camera>
   </a-scene>
</body>
</html>
```

Import Library

- import A-Frame library

<script src="https://aframe.io/releases/0.6.1/aframe.min.js"></script>

- import ARjs, the web-framework for augmented reality

<script src="https://cdn.rawgit.com/jeromeetienne/AR.js/1.5.0/aframe/build/aframe-ar.js"> </script>

Initialize the scene

- A-Frame works using a scene that contains the elements the user wants to display. To create a new scene <a-scene> tag is used

```
<a-scene stats embedded arjs='trackingMethod: best; debugUIEnabled: false'>
<!-- All our components goes here -->
</a-scene>
```

  - stats : it displays stats about your application performance.
  - arjs : some basic ARjs configuration.
    - trackingMethod is the type of camera tracking you use, here we have chosen which is an auto configuration that will be great for our example.
    - debugUIEnabled is set at false in order to remove debugging tools from the camera view.

Shape

- A-frame is built around a generic component <a-entity> tag
- <a-box> has a lot of attributes :

```
<a-box position="0 0 0" rotation="0 0 0"></a-box>
```

  - position : the three coordinates that will be used to position our components
  - rotation : that color of the shape

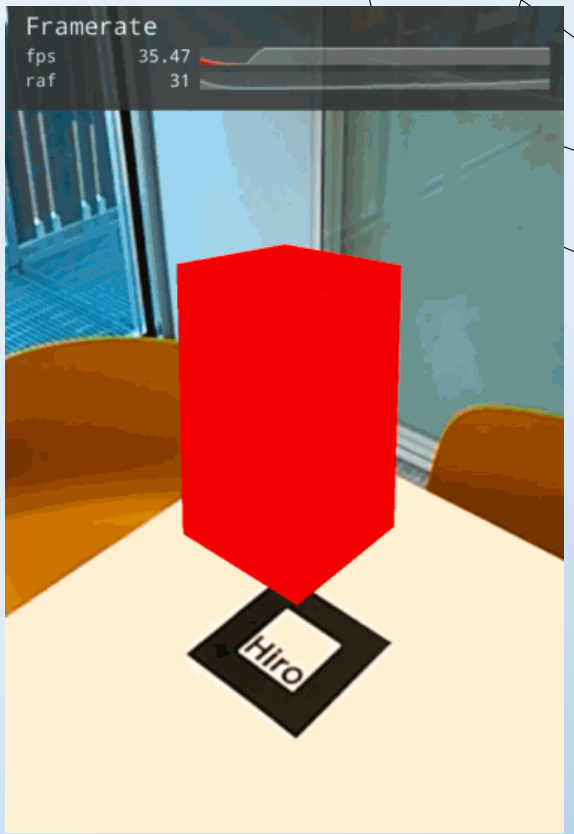
Marker

- use a Hiro marker to start
- *It is a special kind of marker designed for augmented reality*

- It is possible to have custom marker.

Animation

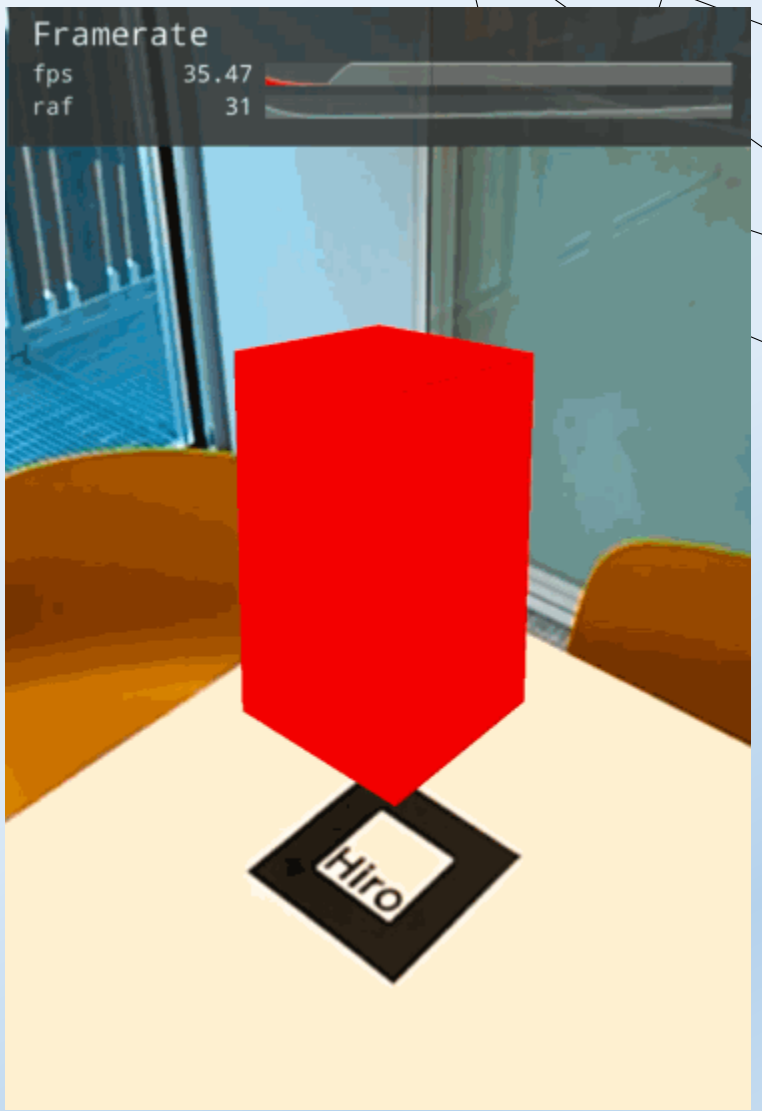
- A-frame contains a component <a-animation> that has been designed to animate an entity.
- Has attributes of our entity such as position, rotation, scale or even color.
  - dur : duration of the animation
  - from : start position or state of the animation
  - to : end position or state of the animation
  - repeat : if and how the animation should be repeated



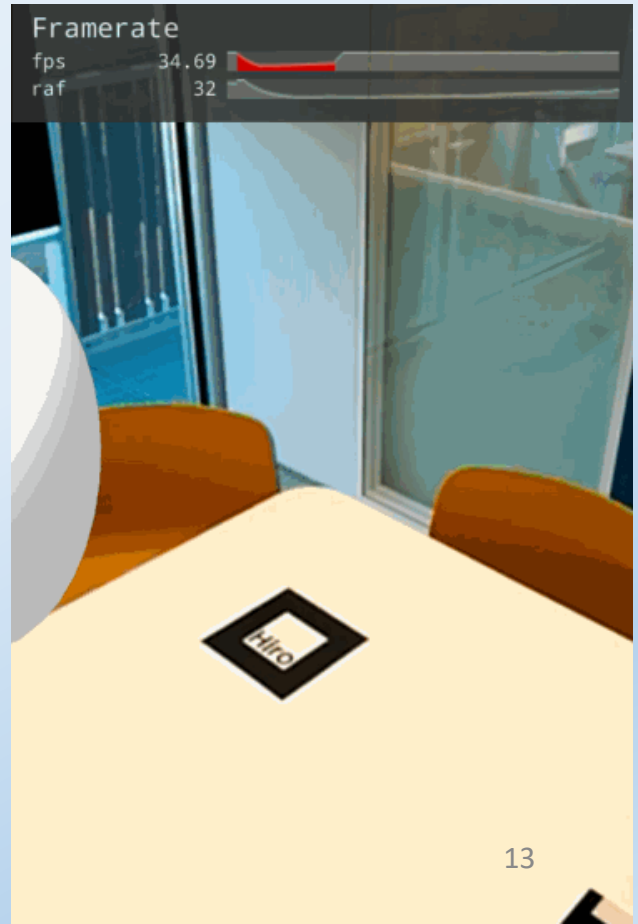
Adding Animation

```
<a-animation
    attribute="rotation"
    dur="2000"
    from="0 0 0"
    to="360 0 0"
    repeat="indefinite">

</a-animation>
```

```
<a-animation
        attribute="position"
        dur="1000"
        from="1 0 0"
        to="0 0 1">

</a-animation>
```



```
<html>
<script src="https://aframe.io/releases/0.6.1/aframe.min.js"></script>
<script src="https://rawgit.com/donmccurdy/aframe-extras/master/dist/aframe-extras.loaders.min.js"></script>
<script src="https://cdn.rawgit.com/jeromeetienne/AR.js/1.5.0/aframe/build/aframe-ar.js"> </script>
 <body style='margin : 0px; overflow: hidden;'>
  <a-scene stats embedded arjs='trackingMethod: best; debugUIEnabled: false'>
  <a-assets>
   <a-asset-item id="avocado" src="https://cdn.rawgit.com/KhronosGroup/glTF-Sample-
Models/9176d098/1.0/Avocado/glTF/Avocado.gltf"></a-asset-item>
  </a-assets>
   <a-marker preset="hiro">
    <a-entity>
     <a-animation attribute="rotation"      dur="2000"      easing="linear"
      from="0 0 0"      to="0 360 0"      repeat="indefinite"></a-animation>
      <a-entity rotation="0 0 25">
       <a-sphere position="2 0 2"></a-sphere>
      </a-entity>
     </a-entity>
   </a-marker>
    <a-entity camera>
  </a-entity>
   </a-scene>
 </body>
</html>
```



Model loading

- load a 3D model inside ARjs and project it on a marker

```
<a-assets>
 <a-asset-item id="smiley" src="https://cdn.rawgit.com/KhronosGroup/glTF-Sample-Models/9176d098/ 1.0/SmilingFace/glTF/SmilingFace.gltf"></a-asset-item>
 </a-assets>


<a-entity gltf-model="#smiley" rotation= "180 0 0">
</a-entity>
```

```
<html>
<script src="https://aframe.io/releases/0.6.1/aframe.min.js"></script>
<script src="https://rawgit.com/donmccurdy/aframe-extras/master/dist/aframe-extras.loaders.min.js"></script>
<script src="https://cdn.rawgit.com/jeromeetienne/AR.js/1.5.0/aframe/build/aframe-ar.js"> </script>
 <body style='margin : 0px; overflow: hidden;'>
  <a-scene  embedded arjs='trackingMethod: best;'>
  <a-assets>
   <a-asset-item id="smiley" src="https://cdn.rawgit.com/KhronosGroup/glTF-Sample-Models/9176d098/1.0/SmilingFace/glTF/SmilingFace.gltf"></a-asset-item>
  </a-assets>
        <a-marker preset="hiro">
   <a-entity gltf-model="#smiley" rotation= "180 0 0">
   </a-entity>
        </a-marker>
        <a-entity camera></a-entity>
  </a-scene>
 </body>
</html>
```

Changing opacity

```
<body style='margin : 0px; overflow: hidden;'>
<a-scene embedded arjs='sourceType: webcam;'>
<a-box position='0 0.5 0' material='opacity: .7;' color="red"></a-box>
<a-marker-camera preset='hiro'></a-marker-camera>
</a-scene>
</body>
```

```
<body style='margin : 0px; overflow: hidden;'>
 <a-scene embedded arjs='sourceType: webcam;'>
    <a-entity
          rotation="-90 0 0"
          geometry="primitive: plane; width: 4; height: auto"
          material="color: blue"
          text="value: NIELIT Chandigarh\n Ropar Campus"></a-entity>
    <a-image src="https://cdn.glitch.me/a12f687b-43cb-4e58-ba35-
0be05e2dce21%2Fnielit.png?v=1633433466066" rotation="-90 0 0"></a-
image>
    <a-marker-camera preset='hiro'></a-marker-camera>
 </a-scene>
 </body>
```