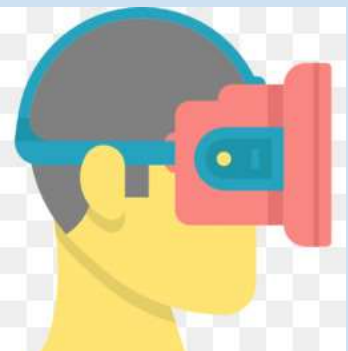




# Augmented Reality

## *making AR happen with A-Frame*

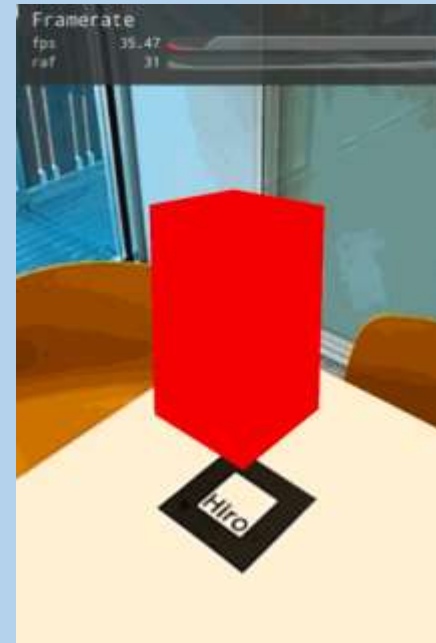
Dr. Sarwan Singh  
NIELIT Chandigarh





# Agenda

- first AR webapp *in less than 10mn* using ARjs
  - Library import,
  - Initialize the scene,
  - Shape,
  - Marker
- Animation
- Model Loading
- Multiple markers

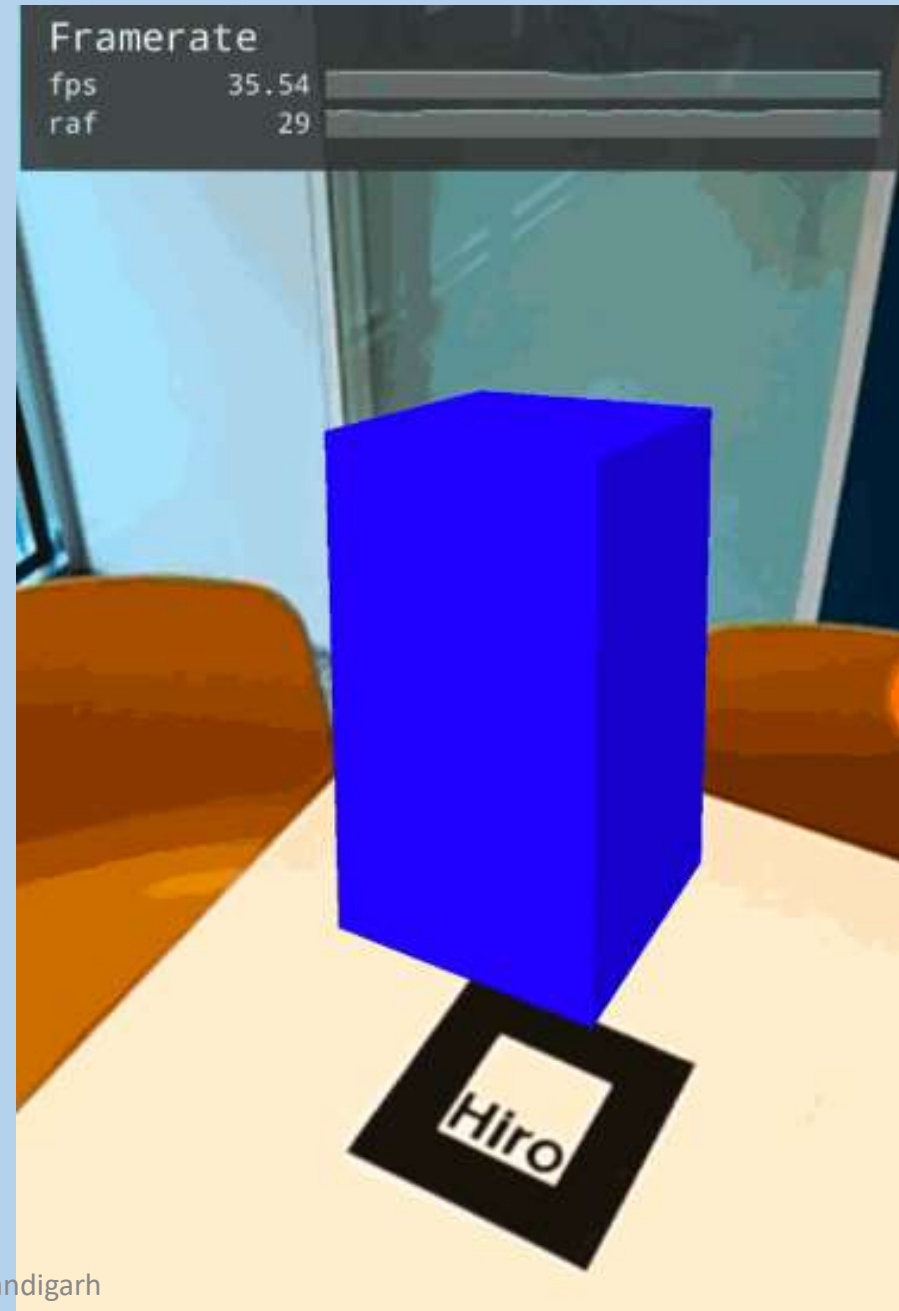




# *first AR example*

- Library import
- Initialize the scene
- Shape
- Marker

Source : theodo.com





# 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.





<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;'>

  <a-marker preset="hiro">

    <a-box position='0 1 0' material='color: blue;'> </a-box>

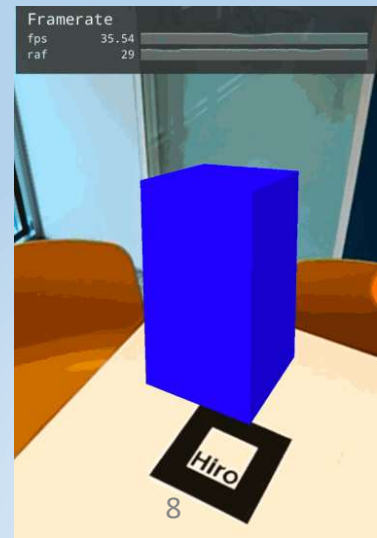
  </a-marker>

  <a-entity camera></a-entity>

</a-scene>

</body>

</html>

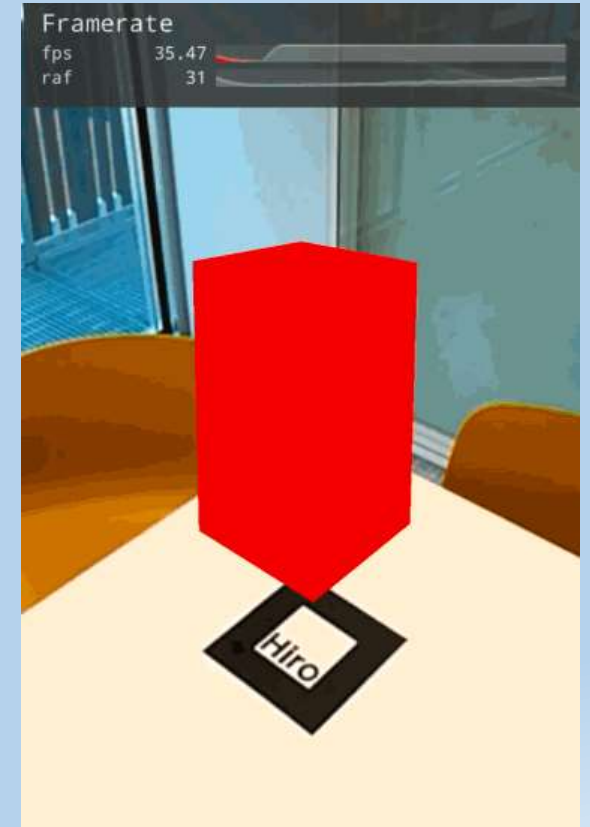






# Animation

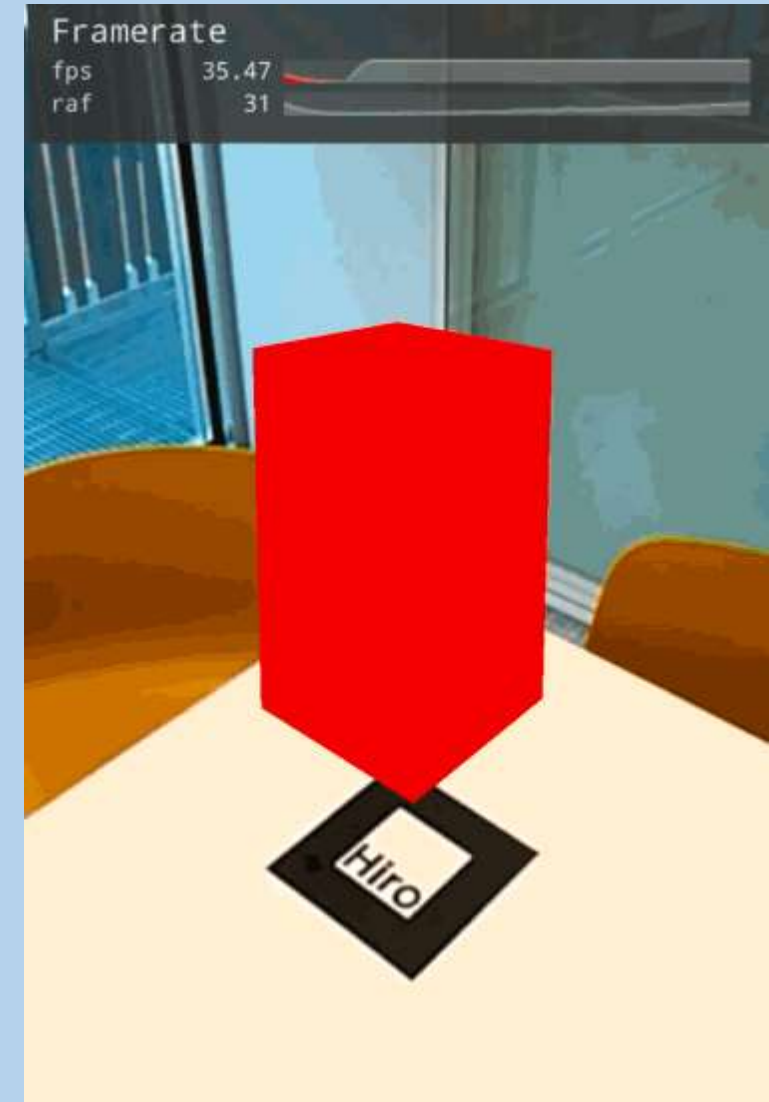
- A-frame contains a component `<a-animation>` that has been designed to animate an entity.
- Has attributes of our entity such as position, rotation, scale or even color.
  - `dur` : duration of the animation
  - `from` : start position or state of the animation
  - `to` : end position or state of the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





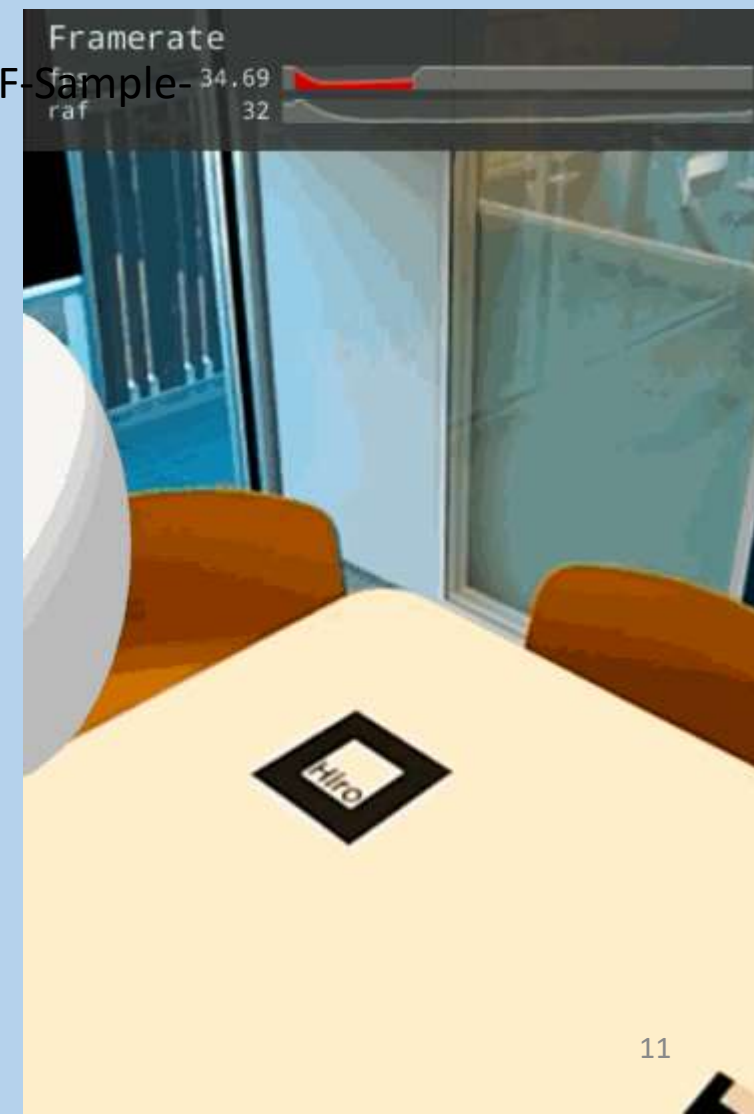
```
<a-animation  
  attribute="rotation"  
  dur="2000"  
  from="0 0 0"  
  to="360 0 0"  
  repeat="indefinite">  
  
</a-animation>
```

```
<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-
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>
```





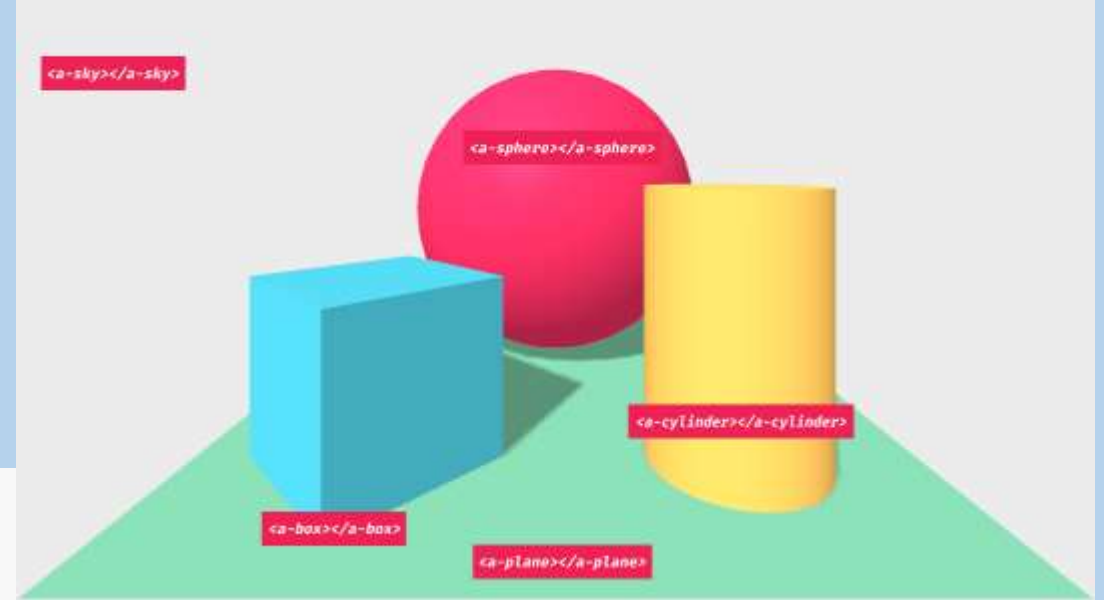
# Multiple markers

```
<script src="https://aframe.io/releases/0.6.0/aframe.min.js"></script>
<script src="https://jeromeetienne.github.io/AR.js/aframe/build/aframe-ar.js">
</script>
<body style='margin : 0px; overflow: hidden;'>
  <a-scene embedded arjs='sourceType: webcam;'>
    <a-marker type='pattern' url='path/to/pattern-marker.patt'>
      <a-box position='0 0.5 0' material='color: red;'></a-box>
    </a-marker>
    <a-marker preset='hiro'>
      <a-box position='0 0.5 0' material='color: green;'></a-box>
    </a-marker>
    <a-marker type='barcode' value='5'>
      <a-box position='0 0.5 0' material='color: blue;'></a-box>
    </a-marker>
    <a-entity camera></a-entity>
  </a-scene>
</body>
```



# 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="#FFC65D"></a-cylinder>
    <a-plane position="0 0 -4" rotation="-90 0 0" width="4" height="4" color="#7BC8A4"></a-plane>
    <a-sky color="#ECECEC"></a-sky>
  </a-scene>
</body>
</html>
```







# Understanding Code

- A-Frame is based on top of [HTML](#) and [the DOM](#) using a polyfill for Custom Elements.
- The HTML layer looks basic, HTML and the DOM are 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 provides a handful of elements such as `<a-box>` or `<a-sky>` called primitives that wrap the entity-component pattern to make it appealing for beginners.

```
<a-scene>
  <a-box position="-1 0.5 -3" rotation="0 45 0" color="#4CC3D9"></a-box>
</a-scene>
```

HTML attribute name      HTML attribute value

HTML element name Opening tag      HTML element name closing tag





<a-box> primitive

<a-box color="red" width="3"></a-box>

Representing this entity-component form

<a-entity geometry="primitive: box; width: 3" material="color: red"></a-entity>



```
<html>
<head>
<script src="https://aframe.io/releases/0.9.2/aframe.min.js"></script>
<script src="https://unpkg.com/aframe-physics-system@1.4.0/dist/aframe-physics-system.min.js"></script>
</head>
<body>
<a-scene physics>
<a-box position="-1 4 -3" rotation="0 45 0" color="#4CC3D9" dynamic-body></a-box>
<a-plane position="0 0 -4" rotation="-90 0 0" width="4" height="4" color="#7BC8A4" static-body></a-plane>
<a-sky color="#ECECEC"></a-sky>
</a-scene>
</body>
</html>
```

Source: <https://github.com/donmccurdy/aframe-physics-system>

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