

AFrame: A Domain Specific Language for Virtual Reality

Extended Abstract

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ABSTRACT

Do Domain Specific Languages (DSLs) have anything to contribute towards the building and animating of three-dimensional scenes for Virtual Reality (VR)? Yes! AFrame is a DSL, and a widely-supported HTML5 extension for building virtual reality experiences. AFrame is open-source, actively developed by Mozilla, and works inside most modern browsers, including mobile browsers. Customizable web-based delivery of VR experiences is possible, because AFrame is a DSL.

CCS CONCEPTS

•Human-centered computing → Virtual reality; •Software and its engineering → Domain specific languages;

KEYWORDS

DSLs, Virtual Reality, HTML5

ACM Reference format:

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Virtual Reality (VR) has reached the masses. Samsung, a major cellphone manufacturer has sold millions of GearVR headsets that turns high-end phones into virtual experiences. The latest Sony Playstation has a VR headset, and Google Cardboard provides an entry-level experience for just a few dollars. The most significant problem facing VR is now content generation, not access to VR headsets.

AFrame, <http://aframe.io>, is an open-source Domain Specific Language (DSL) for generating in-browser VR content. HTML tags are used to declaratively place built-in primitive artifacts in a virtual 3D space, and HTML attributes add different artifact properties, like color, size, location, and animation. Adventurous users can extend the basic DSL, adding new artifacts and properties, using JavaScript. Furthermore, there is a curated set of new artifacts and properties that can be used by any AFrame user via a simple import.

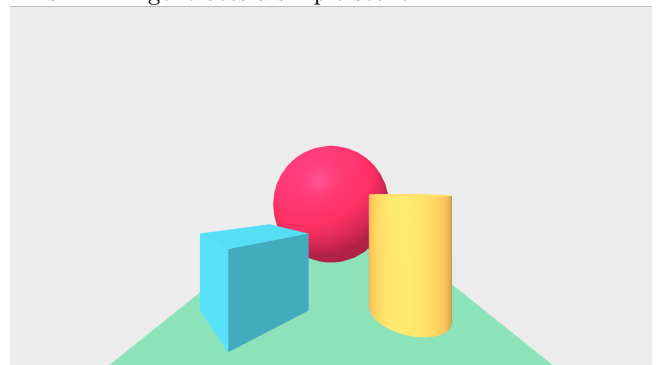
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As a simple example, consider this HTML content, adapted from <https://aframe.io/>:

```
<a-scene>
  <a-sphere position="0 1.25 -1"
    radius="1.25"
    color="#EF2D5E"></a-sphere>
  <a-box position="-1 0.5 1"
    rotation="0 45 0"
    width="1" height="1" depth="1"
    color="#4CC3D9"></a-box>
  <a-cylinder position="1 0.75 1"
    radius="0.5"
    height="1.5"
    color="#FFC65D"></a-cylinder>
  <a-plane rotation="-90 0 0"
    width="4" height="4"
    color="#7BC8A4"></a-plane>
  <a-sky color="#ECECEC"></a-sky>
  <a-entity position="0 0 3.8">
    <a-camera></a-camera>
  </a-entity>
</a-scene>
```

This HTML generates a simple scene.



In a browser, the web user can use the mouse to rotate the scene, and the keyboard to walk through the scene. With a VR headset, the scene is rendered for both eyes, given the illusion of depth.

The interesting parts of AFrame, from a DSL perspective, are the abstraction mechanisms. (1) There are many existing mechanisms for generating HTML, and they can be utilized immediately. Generating HTML is a solved problem! (2) AFrame is built using the entity-component model. Everything in the scene is an entity, and every entity has components attached to give properties to entities. (3) Users can write both new entities, and new components, in JavaScript.