

## EXPLANATORY SHEETS: AUGMENTED REALITY FOR THE WEB

**Reminder:** These roadmaps will allow a better understanding of the workflow of digital interactive contents production through practical recommendations and testimonies of professionals.

In that way, we intend to support learners and teachers in their learnings but also after the training, in their practical working life.

### 1. About the technology

The technology used	Augmented Reality
Final objective and result	Build AR content using a pre-set marker that shows a virtual cube in a website
Description of the tool	<p>Marker based AR, also called image recognition, uses a <b>camera</b> and some <b>visual marker</b> in the real world, to show the result when it recognizes the marker.</p> <p>The place and orientation of the virtual element is calculated to move and interact when the marker moves in the real world.</p> <p><b>A-Frame</b> A-Frame is a web framework that makes easy to start building virtual reality experiences. <a href="https://aframe.io/">https://aframe.io/</a></p> <p><b>AR.js</b> Is an open source library for augmented reality in the web, based in javascript that works in any phone and platform <a href="https://ar-js-org.github.io/AR.js-Docs/">https://ar-js-org.github.io/AR.js-Docs/</a></p>

Medium used (computer, tablet, phone)	Computer and an image (marker) that can be printed or shown with another screen
Where will it be accessible (app, platform, website...)	Website, works in every browser and platform, every Android phone, and iPhones above iOS 11.
How long did it take to develop this tool?	Write the code and test: 15 min. Personalize and reuse it can take a few hours depending on the parameters.

## 2. Used software

Name of the software	Glitch.com (html editor) <a href="https://glitch.com/">https://glitch.com/</a> A-Frame <a href="https://aframe.io/">https://aframe.io/</a> AR.js <a href="https://ar-js-org.github.io/AR.js-Docs/">https://ar-js-org.github.io/AR.js-Docs/</a>
Name of the company	Glitch AR.js organization A-Frame
Copyright status (cc, proprietary system, etc)	MIT License A short and simple permissive license with conditions only requiring preservation of copyright and license notices. Licensed works, modifications, and larger works may be distributed under different terms and without source code.

## 3. Cost

Cost of the creation of this tool	0€ If you use shapes, text, or free images or 3d objects, some 3d objects might be subject to a fee.
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#### 4. Steps of production

Please describe each step of the production of the tool

##### Design phase

Why did you create this tool?	This tool is a starting point to understand how to use open source code to develop AR content, and to get familiar with some of their characteristics. To develop AR content, most of the time, developer tools are needed, but this model uses simple online tools to make it possible.
What functionalities does it have?	Augmented reality usually works through Taylor made applications, these apps must be added to app stores which are both costly and time-consuming. Although that's the best option for some projects, in some cases using AR into a website can be useful for many different functionalities. This model also helps learners to dig into coding and open source tools.
What will be its purpose? (pedagogical, communication, games, etc.)	Web design: this model can be added to any website for example to show directions, extra information, and e-commerce. Pedagogical: with tools like glitch it is possible to use code easily and show engaging results.

#### 5. Creation phase

Please name and describe below the different steps of the creation of the tool (min 5)

<b>Start a Project</b>	<p>Open a browser in your laptop (Google Chrome or Firefox have been tested), go to <a href="https://glitch.com/">https://glitch.com/</a> and create an account with your E-mail, Facebook, GitHub or Google account.</p> <p>Glitch is a tool where it is possible to build and test web applications easily, to develop this tool there's no need to upgrade the account.</p>
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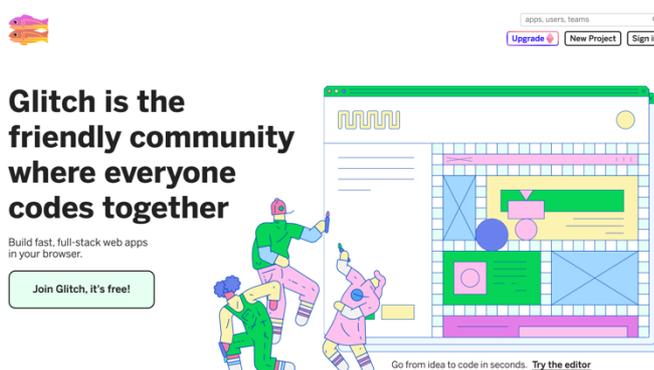


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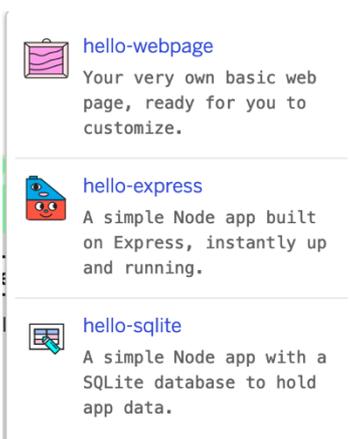
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(It is possible to skip this step and write the following code in a HTML editor such as Atom or sublime text. It is also possible to use simple text editors like notepad or text edit to write HTML code, we only need to save the files as .html. Glitch.com option is the most convenient to test)



Once inside glitch, click on **New Project** and choose **hello-webpage**

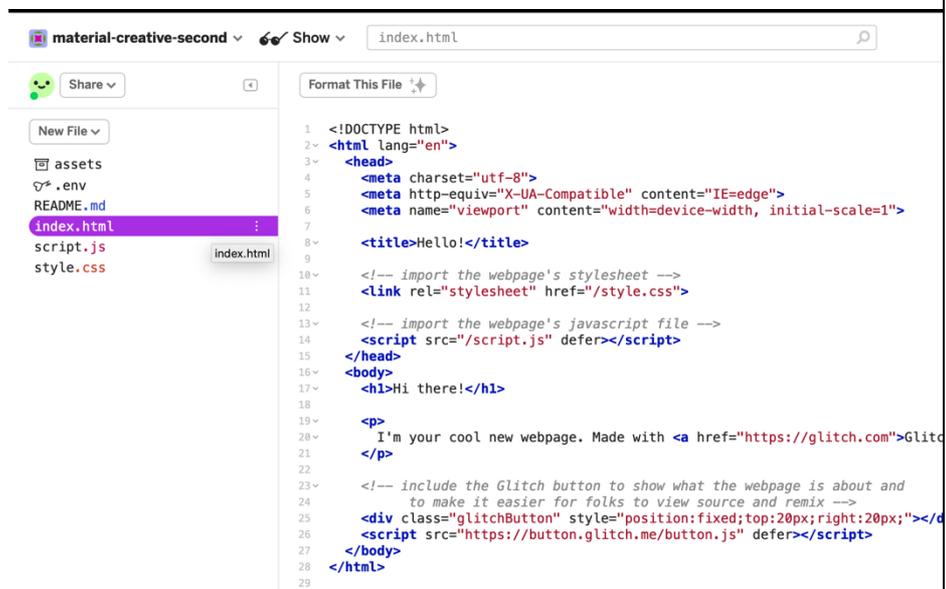


## Get familiar with the interface

Clicking the title, we can rename it and add a description. Using **show** we see how the application looks like.

On the left side we have several tabs to write code, these are the files in our website, for this model we are only using the **index.html** tab or file.

**Format This File** will help us to find possible mistakes and auto correct some of them.



```

1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4 <meta charset="utf-8">
5 <meta http-equiv="X-UA-Compatible" content="IE=edge">
6 <meta name="viewport" content="width=device-width, initial-scale=1">
7
8 <title>Hello!</title>
9
10 <!-- import the webpage's stylesheet -->
11 <link rel="stylesheet" href="/style.css">
12
13 <!-- import the webpage's javascript file -->
14 <script src="/script.js" defer></script>
15 </head>
16 <body>
17 <h1>Hi there!</h1>
18
19
20 <p>
21 I'm your cool new webpage. Made with <a href="https://glitch.com">Glitch
22 </p>
23
24 <!-- include the Glitch button to show what the webpage is about and
25 to make it easier for folks to view source and remix -->
26 <script src="https://button.glitch.me/button.js" defer></script>
27 </body>
28 </html>
29

```

Erase all the code in **index.html** to start from scratch.

## Code: Include Libraries

Include the libraries mentioned above:

Write this code to include the A-Frame build that we will be using in our project, ([here](#) you can find the last release, change it if needed) :

```
<script
src="https://aframe.io/releases/1.0.0/aframe.min.js"></script>
```

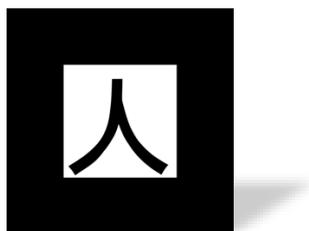
Include AR.js which will make our A-frame project AR enabled:

	<pre>&lt;script src="https://raw.githack.com/AR-js-org/AR.js/master/aframe/build/aframe-ar.js"&gt;&lt;/script&gt;</pre>
<p><b>Code: the body</b></p>	<p>Define the body, this step is common to all HTML pages:</p> <pre>&lt;body style="margin : 0px; overflow: hidden;"&gt;</pre> <p>Once the body is defined, create a 3d scene with A-frame and define that we would like to use ar.js to create an AR scene.</p> <pre>&lt;a-scene embedded arjs&gt;</pre> <p>To close the scene, at the end of the contents of the scene use</p> <pre>&lt;/a-scene&gt;</pre> <p>Add a marker inside the scene, with this, the application will detect it and display a virtual content when the marker is in focus on the computer camera. (We will use the “kanji preset marker”).</p> <pre>&lt;a-marker preset="kanji"&gt; &lt;/a-marker&gt;</pre> <p>Add objects to the scene, in this case we add a simple box <code>&lt;a-box&gt;</code>, the position makes the object displays on top of the marker, and the color is green.</p> <pre>&lt;a-box position="0 0.5 0" material="color: green;"&gt;&lt;/a-box&gt;</pre> <p>Finally, we define the camera component that defines from which perspective the user views the scene.</p> <pre>&lt;a-entity camera&gt;&lt;/a-entity&gt;</pre> <p>The complete code should look like this:</p> <pre>&lt;script src="https://aframe.io/releases/1.0.4/aframe.min.js"&gt;&lt;/script&gt;</pre>

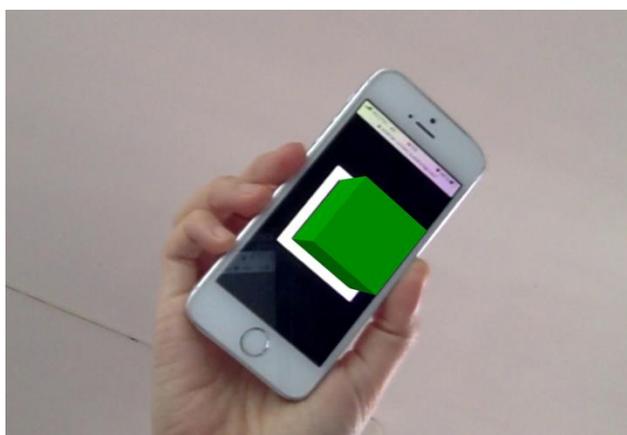
	<pre> &lt;script src="https://raw.githack.com/AR-js- org/AR.js/master/aframe/build/aframe-ar.js"&gt;&lt;/script&gt;  &lt;body style="margin : 0px; overflow: hidden;"&gt;    &lt;a-scene embedded arjs&gt;      &lt;a-marker preset="kanji"&gt;        &lt;a-box position="0 0.5 0" material="color: green;"&gt;&lt;/a- box&gt;      &lt;/a-marker&gt;    &lt;a-entity camera&gt;&lt;/a-entity&gt;  &lt;/a-scene&gt;  &lt;/body&gt; </pre>
<p><b>Test</b></p>	<p>Once the code is finished go to <b>show</b> button in glitch, choose to see the result in a new window or next to the code.</p>  <p>The screenshot shows a 'Show' button with a dropdown arrow. Below it are two preview windows. The first window, labeled 'In a New Window', shows a blue abstract shape with white and yellow dots. The second window, labeled 'Next to The Code', shows the same shape next to a code editor with lines of code.</p>



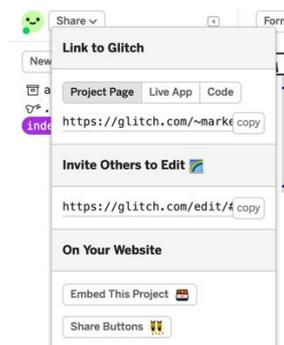
The browser will ask you to get access to the computer camera, you should see the computer camera, to see the box you have to show the **Kanji marker**:



Use this image printed or with another screen. You should see something like this:



Notice that you can also click on the **Share** button in glitch, you can copy the link and open it on a smartphone, tablet and any computer to see the result.



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<p><b>Optional: Reuse</b></p>	<p>Change the <b>AR content</b> with A-Frame by changing or adding attributes, you can see all attributes for &lt;a-box&gt; in:  <a href="https://aframe.io/docs/1.0.0/primitives/a-box.html">https://aframe.io/docs/1.0.0/primitives/a-box.html</a></p> <p>We can use different shapes, for example try to use different shapes changing &lt;a-box&gt; for another shapes such as &lt;a-cylinder&gt;, &lt;a-sphere&gt;, &lt;a-torus&gt;.</p> <p>We can also upload 3d Models, see more info at:  <a href="https://aframe.io/docs/1.0.0/introduction/models.html">https://aframe.io/docs/1.0.0/introduction/models.html</a></p>
<p><b>Optional: Personalize marker</b></p>	<p>To personalize the marker it is possible to use the AR.js Marker generator: (<a href="https://jeromeetienne.github.io/AR.js/three.js/examples/marker-training/examples/generator.html">https://jeromeetienne.github.io/AR.js/three.js/examples/marker-training/examples/generator.html</a>) with this 3 steps:</p> <ol style="list-style-type: none"> <li>1. Upload the image. It is also possible to use barcodes and patterns as markers.</li> <li>2. Download the “trained marker”, this will be a .patt archive, This file contains the encoded marker that you should reuse in your code. We also need to add the address or url of the file to the code, in our case &lt;a-marker-camera&gt; should be replaced by the following: <pre>&lt;a-marker-camera type='pattern' url='path/to/pattern-marker.patt'&gt;&lt;/a-marker-camera&gt;</pre> <p>Where 'path/to/pattern-marker.patt' have to be replaced with the url, this can be online or on your own computer.</p> </li> <li>3. Download the image to be printed and used as marker</li> </ol>

## 6. Test phase

### Release

Where did you publish the tool?	You can find the model here: <a href="https://glitch.com/~marker-based-ar-dimpa">https://glitch.com/~marker-based-ar-dimpa</a>
Why?	Glitch.com is an easy way to test and make changes, and is also possible for any user to “remix” it.
Have you encountered any difficulties in this step?	no
If yes, please explain	

## 7. Inclusive approach

What action did you implement to make this tool inclusive to as many users as possible?

The tool is made fully with open source software and tools, it is cross-browser, it works on every Android phone and iPhones above iOS 11, and computers.

## 8. Good / bad practices

Would you recommend this software to the users?	Yes, if they want to use code and open source tools.
Please explain	It is a good tool to explore the possibilities of AR, and one of the easiest ways, using free and open source libraries and possibilities. There is a large community supporting AR.js and testing its possibilities.

What recommendation would you give to people creating such tool or creating content on this technology?

It is recommendable to have basic HTML knowledge, and the tool is a demo to show the augmented reality possibilities, but always remember that to build an Augmented Reality application advanced programming skills, and professional tools may be needed.



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