

Intellectual Output_02:

EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems

Toolkit 5
Virtual Reality/ Augmented Reality
(VR/AR)

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC
MECHATRONIC SYSTEMS

**E-toolkit – Virtual Reality/
Augmented Reality**

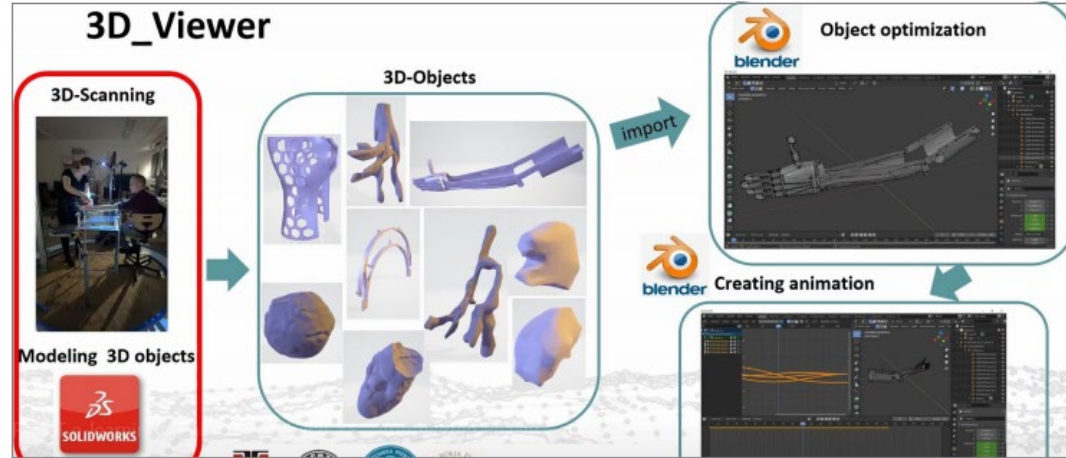
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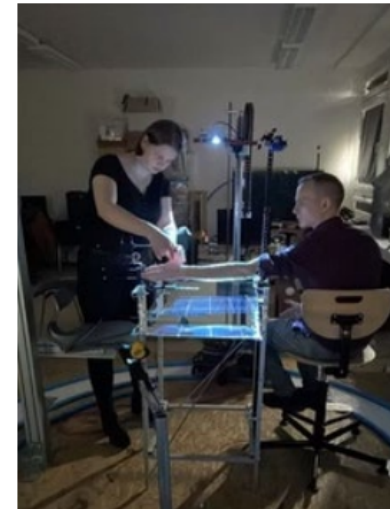
1. Overview of whole process



To create the 3D preview in Augmented reality we need 3D objects, we can get this through following steps:

- 3D scanning
- Or modeling of the 3D objects

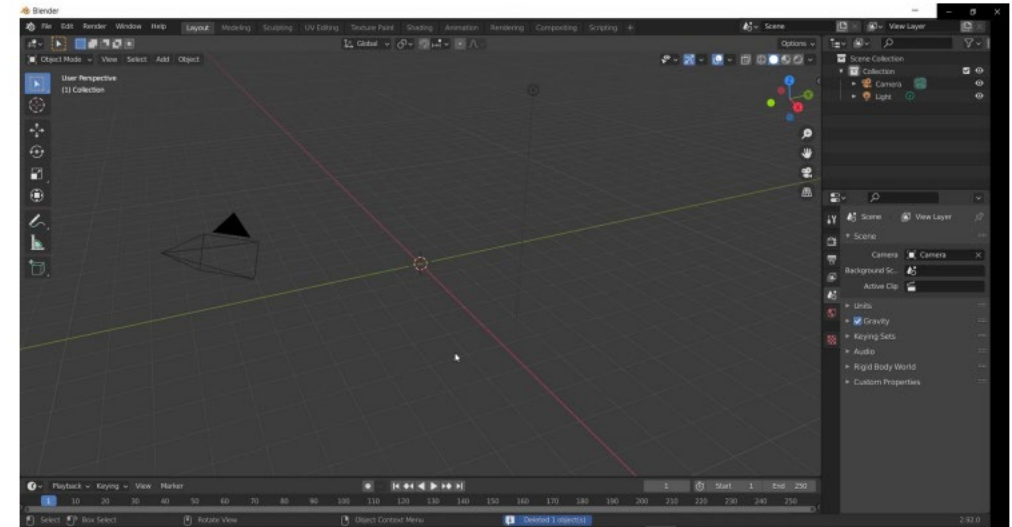
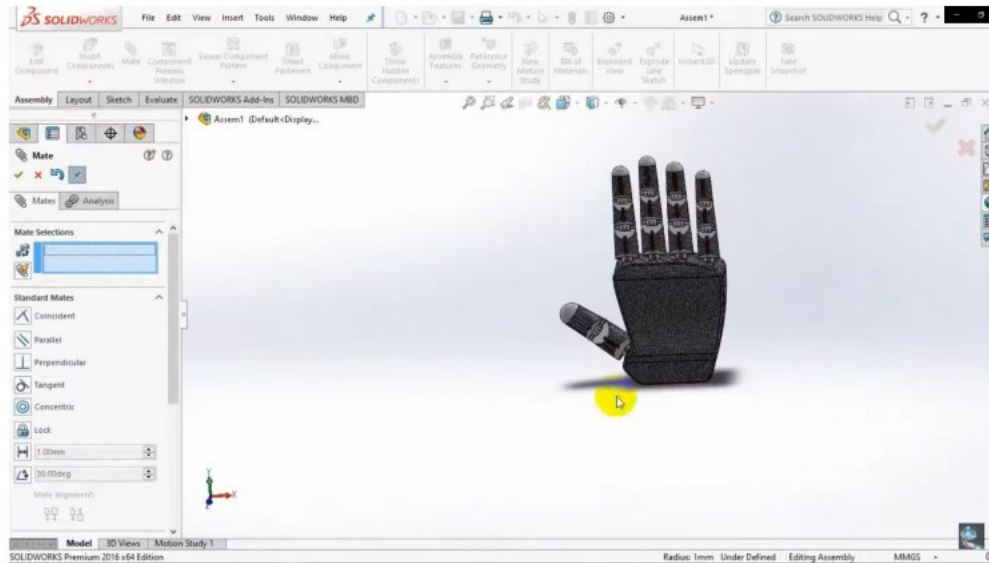
Then there is a process which involves object optimization and creating animation. Here we can see the scanning scanning of a hand in detail:



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2. Building Augmented Reality animations

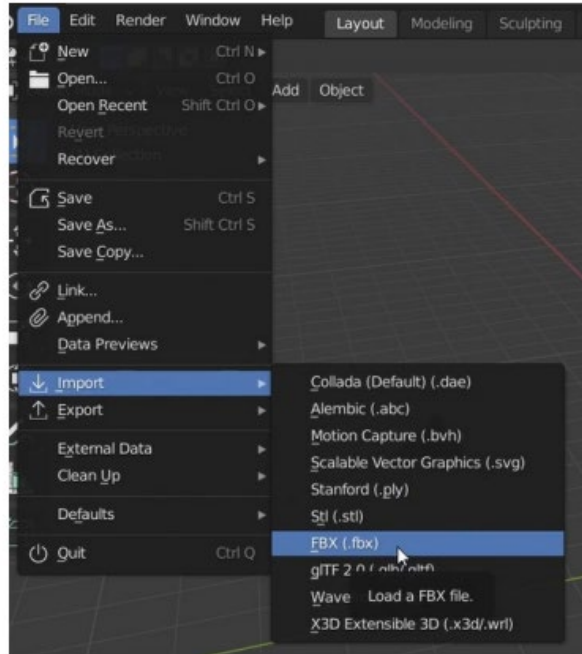
2.1 Introduction to Blender software



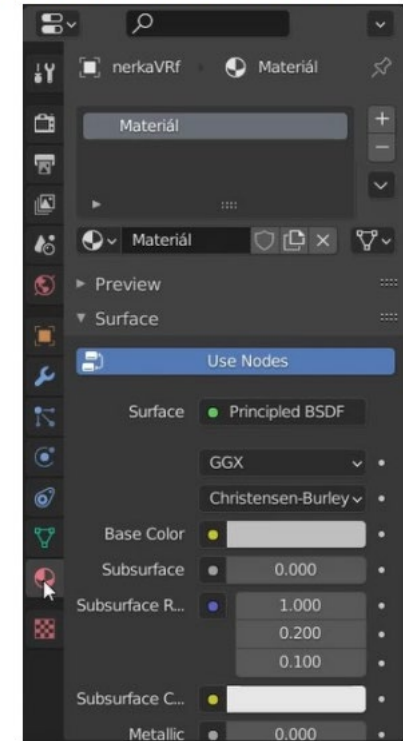
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That means if we have a vertex files, we can create animation in Blender software. This is a simple process where we import the model first:

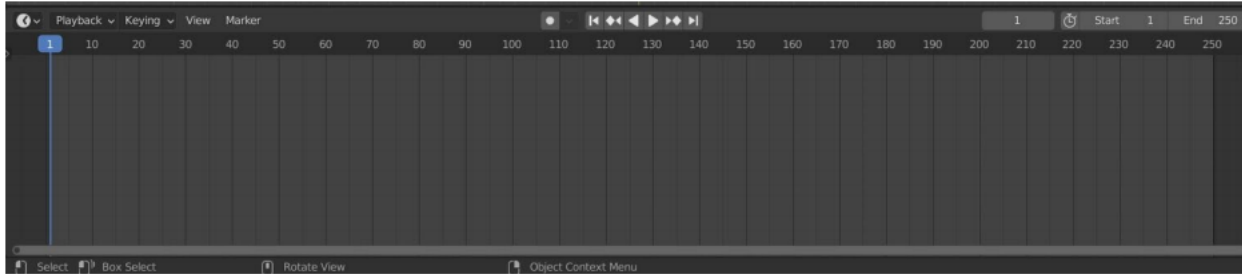


We can change the materials or specifications of the object we will switch to view specifically color palette of this object in right bottom corner:

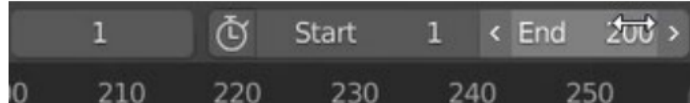


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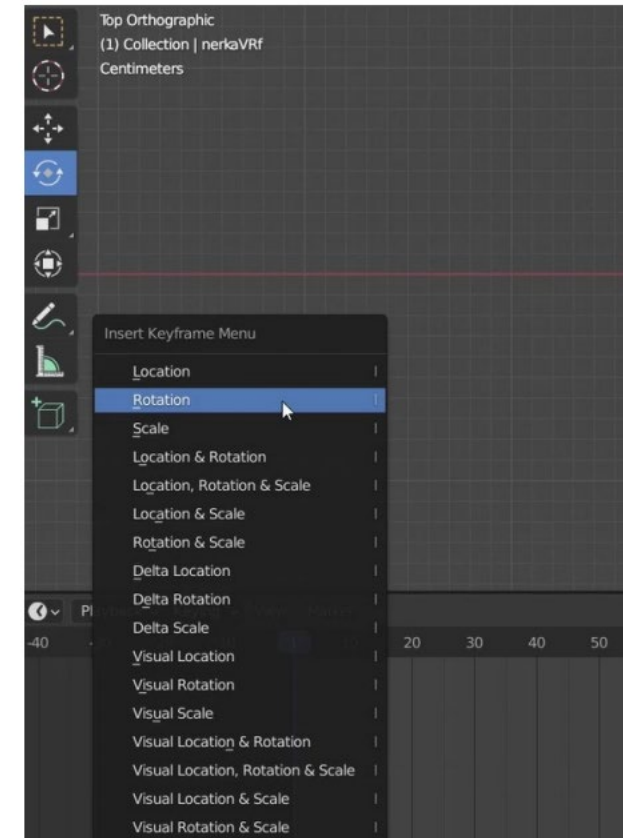
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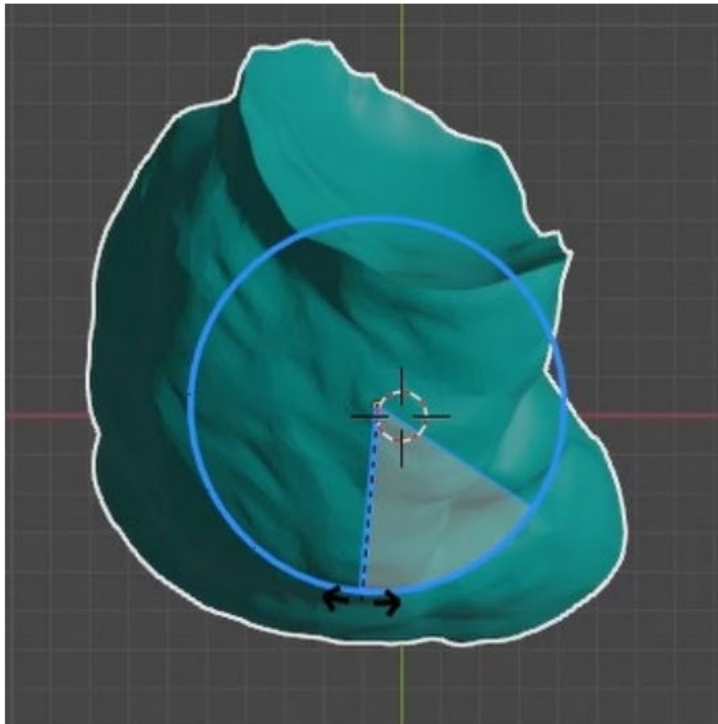
We will set the starting and ending of the timeline



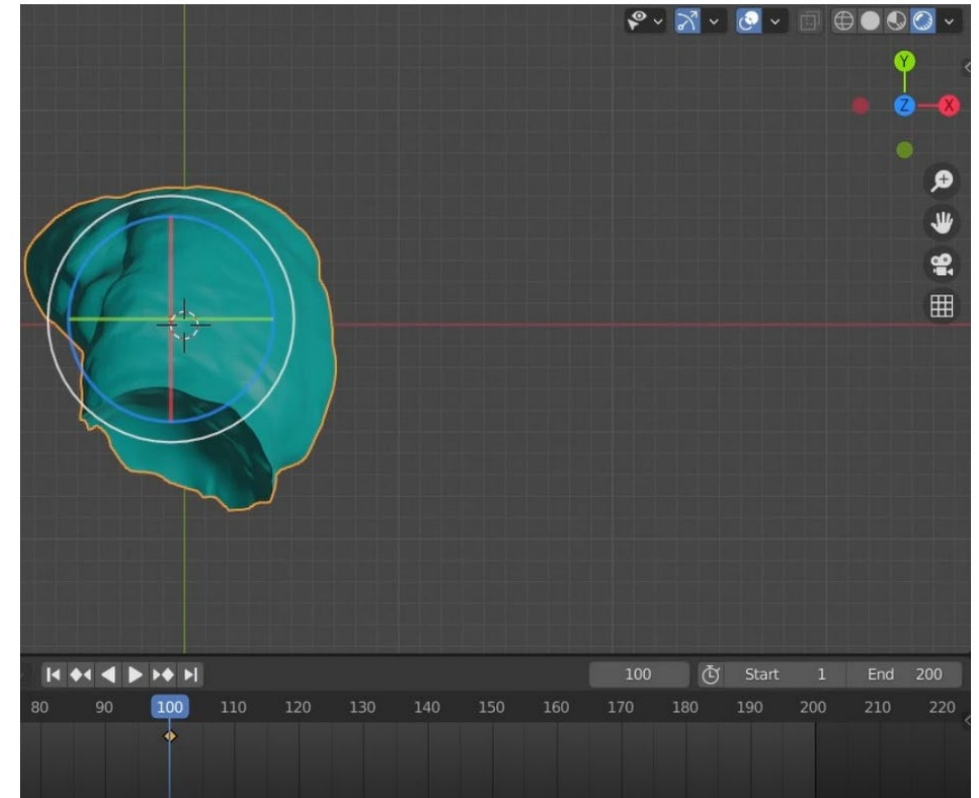
On the first second of timeline, we will create a first frame of the rotation through axis y – by pressing the KEY button “I”. Then selecting Rotation from the Edit Mode, or by pressing “R” we rotate the object through axis y.



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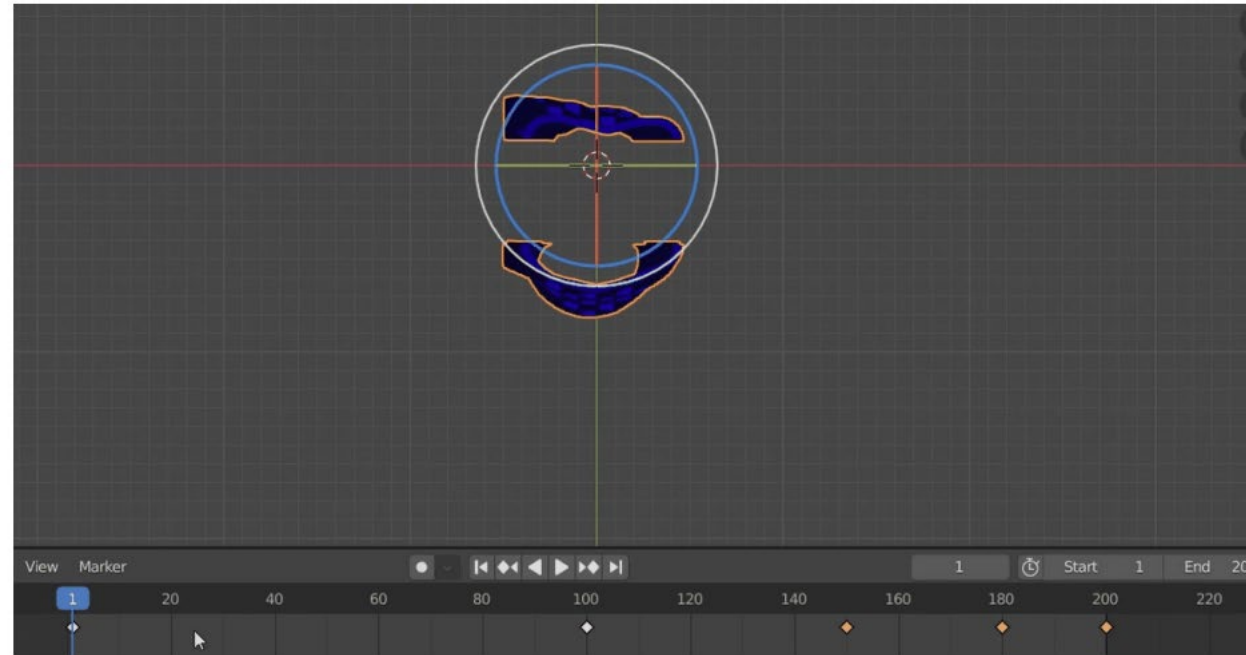
We will fix this position at 100. This means we will move to frame 100 with mouse and then rotate the object by pressing "R" and then pressing the KEY button "I" to fix it.



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Here is preview of another object where we created another animation:

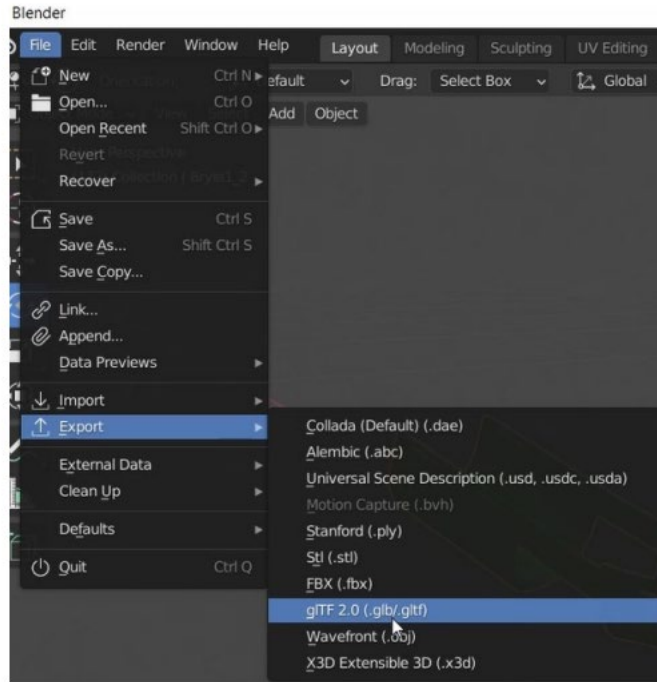


We can also create more complex animations.

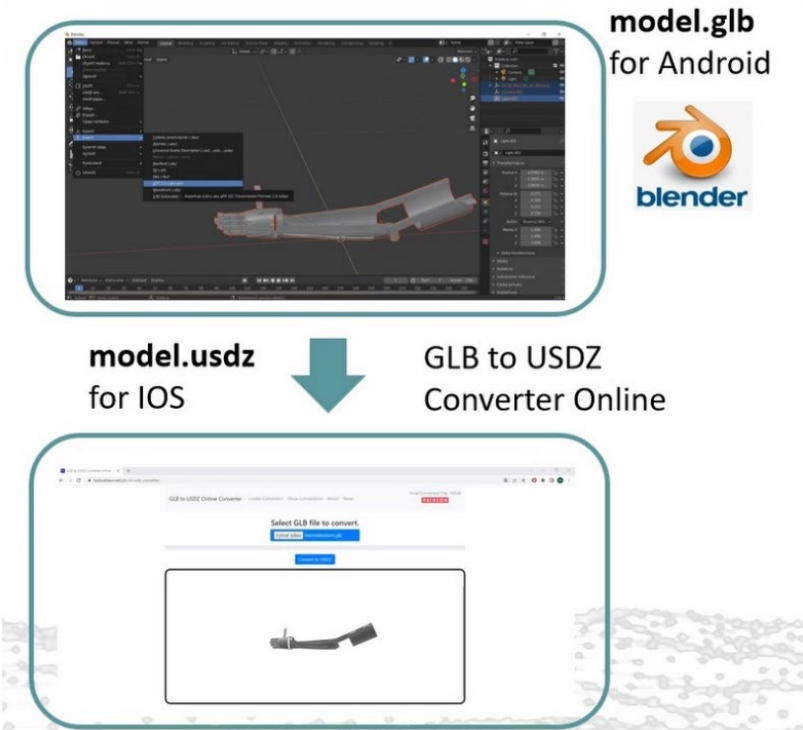
Once we have the objects created, we need to save them and export them into Glb file for Android.

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Or we can use the USDZ format, which is for IO OS, we can find the online core value converter for such.



model.glb
for Android



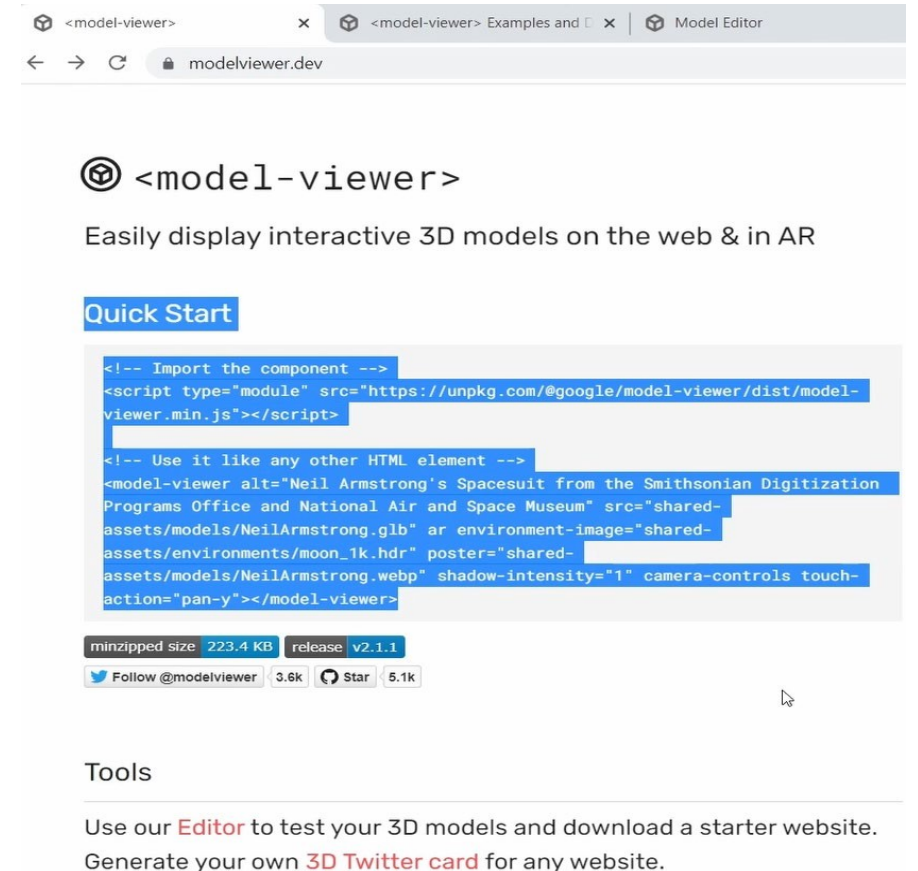
model.usdz
for IOS

GLB to USDZ
Converter Online

2.2. Creating website to display AR models

Once we have the individual models, we use the web interface WEB APP – 3D Viewer, which is used to create preview of the 3D models using the HTML code.

At www.modelviewer.dev we have the documentation and examples. This documentation is right iterated to the specific model viewer. And we can utilize the editor <https://modelviewer.dev/editor/> where we can test our code, there are some examples from where we can get an inspiration.

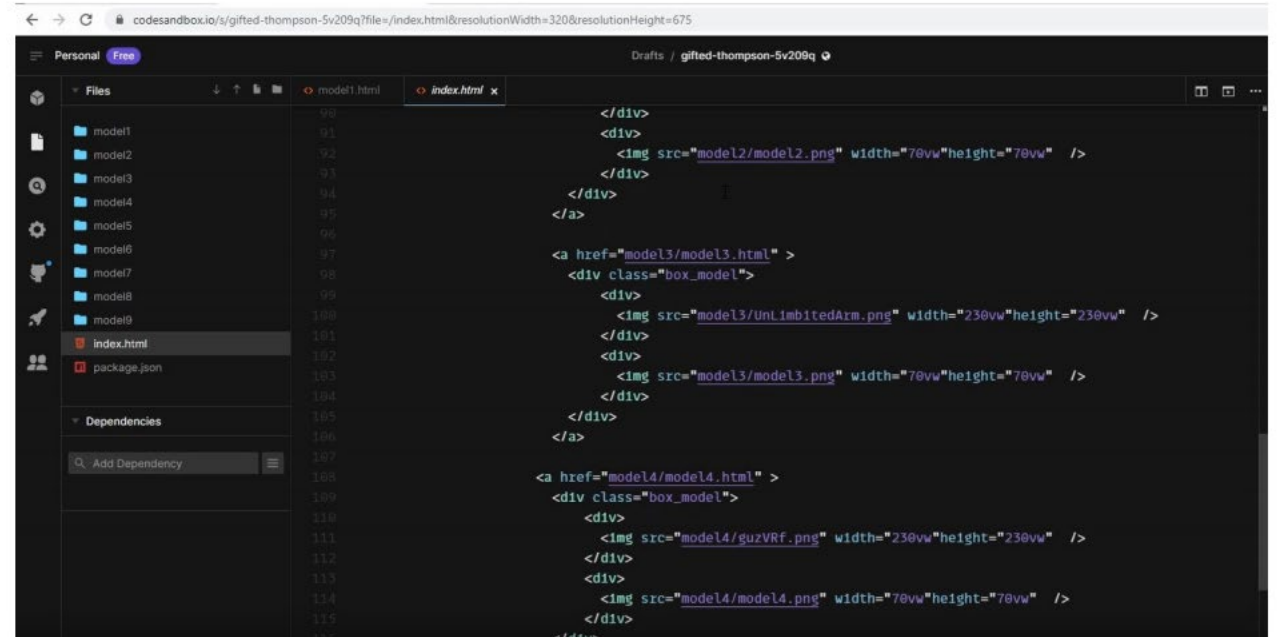


The screenshot shows a web browser displaying the Model Viewer documentation. The page title is "<model-viewer>" and the subtitle is "Easily display interactive 3D models on the web & in AR". There is a "Quick Start" section with a code block showing the HTML and JavaScript code for embedding the viewer. Below the code block, there are statistics for the package: "minzipped size 223.4 KB", "release v2.1.1", "Follow @modelviewer 3.6k", and "Star 5.1k". There is also a "Tools" section with text: "Use our Editor to test your 3D models and download a starter website. Generate your own 3D Twitter card for any website."

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Once we have the code, we need to publish it. Either this could be own web server or it could be a code sandbox where we will publish our code. It's free it only requires registration at <https://codesandbox.io/>

There we can start a website. Here in our example we can see specific environment where we have index, which is a main site.



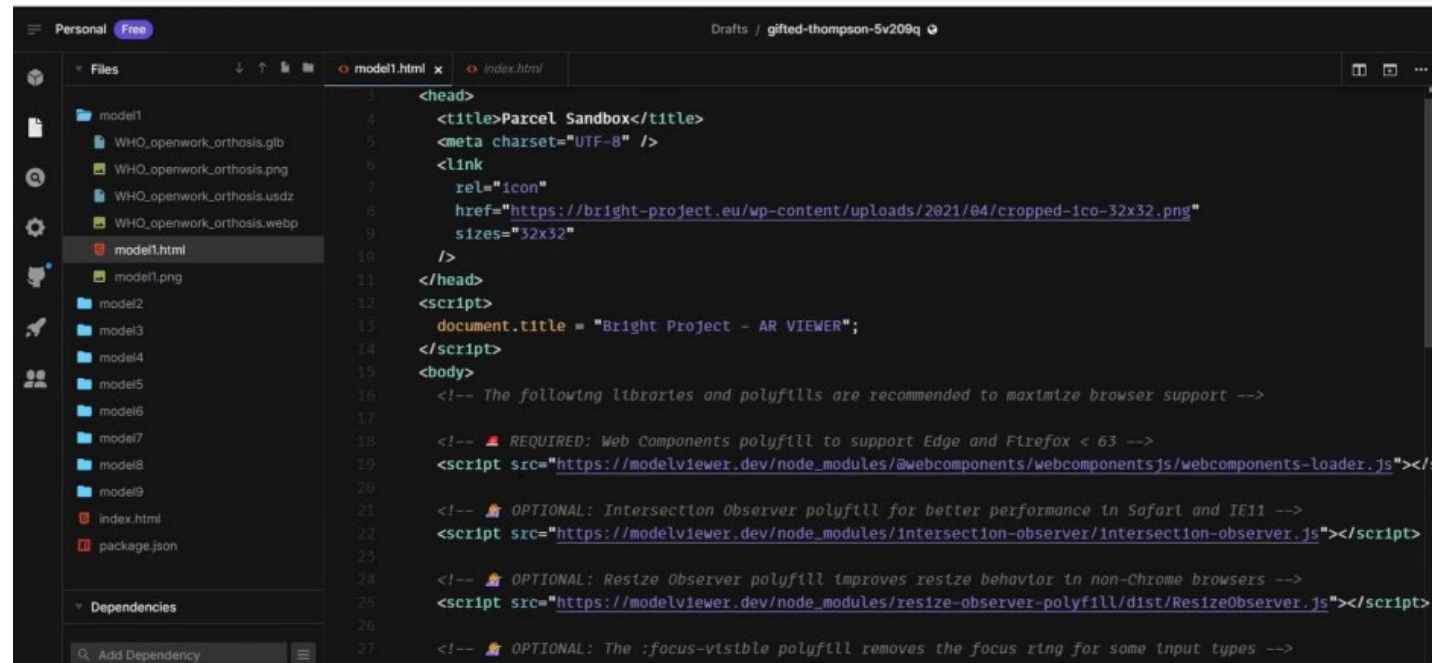
```
Personal (Free) Drafts / gifted-thompson-5v209q  
Files  
model1 90  
model2 91  
model3 92  
model4 93  
model5 94  
model6 95  
model7 96  
model8 97  
model9 98  
index.html 101  
package.json 103  
Dependencies  
Add Dependency  
model1.html  
index.html x  
</div>  
<div>  
  
</div>  
</div>  
</a>  
<a href="model3/model3.html" >  
<div class="box_model">  
<div>  
  
</div>  
<div>  
  
</div>  
</div>  
</a>  
<a href="model4/model4.html" >  
<div class="box_model">  
<div>  
  
</div>  
<div>  
  
</div>  
</div>  
</a>
```

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The sub site of the first object contains individual code as well.

The site will generate from 3Dmodel html code a model displayed in augmented reality, either Android or iOS. Which we can click, we can rotate it and interact with.



```
Personal Free Drafts / gifted-thompson-5v209q
Files
model1
WHO_openwork_orthosis.glb
WHO_openwork_orthosis.png
WHO_openwork_orthosis.usdz
WHO_openwork_orthosis.webp
model1.html
model1.png
model2
model3
model4
model5
model6
model7
model8
model9
index.html
package.json
Dependencies
Add Dependency

model1.html
<head>
<title>Parcel Sandbox</title>
<meta charset="UTF-8" />
<link
  rel="icon"
  href="https://bright-project.eu/wp-content/uploads/2021/04/cropped-ico-32x32.png"
  sizes="32x32"
/>
</head>
<script>
  document.title = "Bright Project - AR VIEWER";
</script>
<body>
  <!-- The following libraries and polyfills are recommended to maximize browser support -->
  <!-- REQUIRED: Web Components polyfill to support Edge and Firefox < 63 -->
  <script src="https://modelviewer.dev/node_modules/@webcomponents/webcomponentsjs/webcomponents-loader.js"></script>
  <!-- OPTIONAL: Intersection Observer polyfill for better performance in Safari and IE11 -->
  <script src="https://modelviewer.dev/node_modules/intersection-observer/intersection-observer.js"></script>
  <!-- OPTIONAL: Resize Observer polyfill improves resize behavior in non-Chrome browsers -->
  <script src="https://modelviewer.dev/node_modules/resize-observer-polyfill/dist/ResizeObserver.js"></script>
  <!-- OPTIONAL: The :focus-visible polyfill removes the focus ring for some input types -->
```

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