PRACTICAL WORK 1
GEOMETRY – CAMERAS – CONTROLS

Prerequisites

JavaScript:

- https://javascript.info/
- https://www.w3schools.com/js/default.asp
- Etc.

Three.js:

- 09 - Introduction to threejs
- https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene
- https://threejs.org/manual/#en/scenegraph

Exercise 1 – Primitives

Documents:

- https://threejs.org/manual/#en/primitives
- https://threejs.org/docs/index.html#api/en/objects/Line

1. Creates a scene that contains on the same plane (YZ) all the primitives available in three.js
2. Reproduce these primitives 3 times on the X axis by modifying at least one parameter of their geometry.
3. Write a function allowing to create marks (cross based on segments) on the ground of a 3D environment identical to those present in this image:
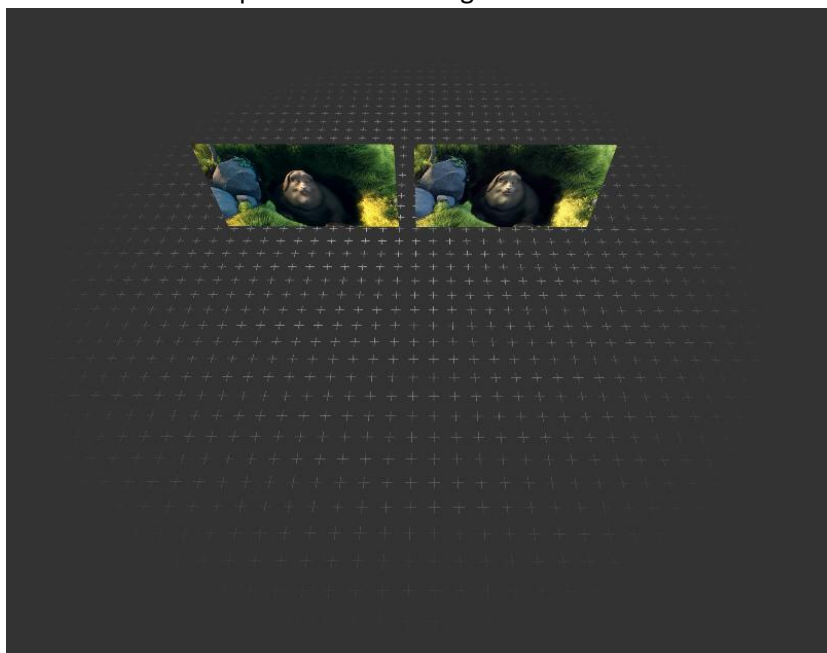
4. Use this function to add these marks inside the scene 1.

Exercise 2 – Cameras and Controls

Documents:

- https://threejs.org/manual/#en/cameras
- https://threejs.org/docs/index.html#examples/en/controls/FirstPersonControls
- https://threejs.org/docs/index.html#examples/en/controls/FlyControls
- https://threejs.org/docs/index.html#examples/en/controls/OrbitControls
- https://threejs.org/docs/index.html#examples/en/controls/TrackballControls

1. In the same web page, display the scene from "exercise 1.4" twice: one scene with an orthographic camera and second one with a perspective camera.
2. Use the different control techniques available in three.js to interact with these 2 types of cameras.

Exercise 3 – Custom geometry and texture coordinates

Documents:

- https://threejs.org/manual/#en/custom-buffergeometry
- https://threejs.org/manual/#en/textures

Consider the 3D scene with 3 boxes available in the file "customgeometry.html" and make a square hole on each face of these box. This produces the following effect on one face:
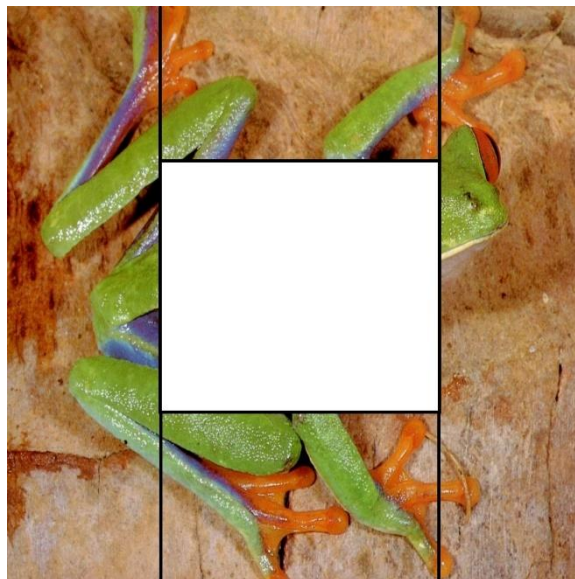
For this you must modify the geometry structure of each face in the custom geometry object, faces which are now defined as a set of 4 rectangles (which correspond to 8 triangles) instead of one initially used (which was corresponding to 2 triangles). To keep the textures correctly mapped you also must assign correct values to the texture coordinates associated to each vertex.

Exercise 4 – Hierarchical transformations

Build a scene allowing to simulate in 3D the movements of one arm of Blue (a low-cost, human-friendly robot designed for AI by UC Berkeley see https://news.berkeley.edu/2019/04/09/meet-blue-the-low-cost-human-friendly-robot-designed-for-ai/)
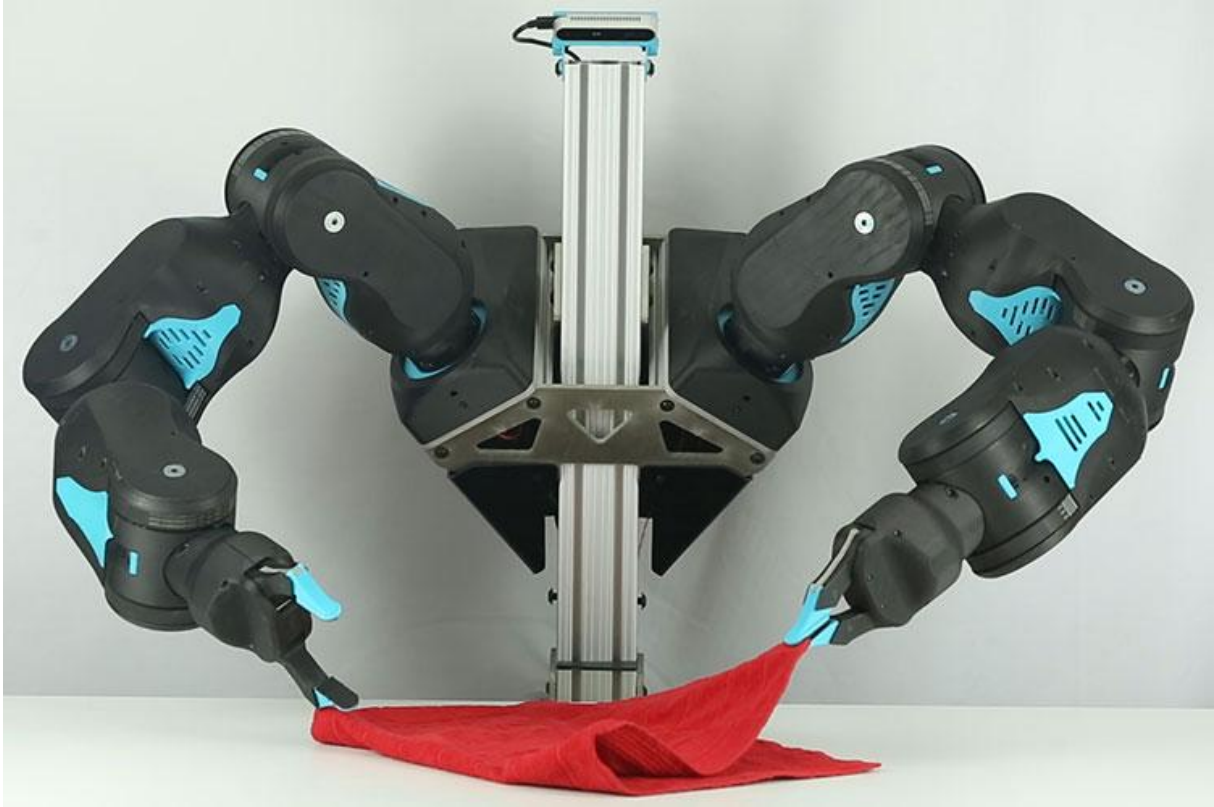
Your 3D model should look like this image (with two arms), with textures (add some logos on it). It must be able to move with the same degrees of freedom as those present in this image and this video (https://www.youtube.com/watch?v=KZ88hPgrZzs).

Animate this model.

Exercise 5 – VR and MR experimentation

Document:

- https://threejs.org/manual/#en/webxr-basics

Transform exercise 5 in a VR and MR experience.