

PRACTICAL WORK 1

GEOMETRY – CAMERAS – CONTROLS

Prerequisites

JavaScript:

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

Three.js:

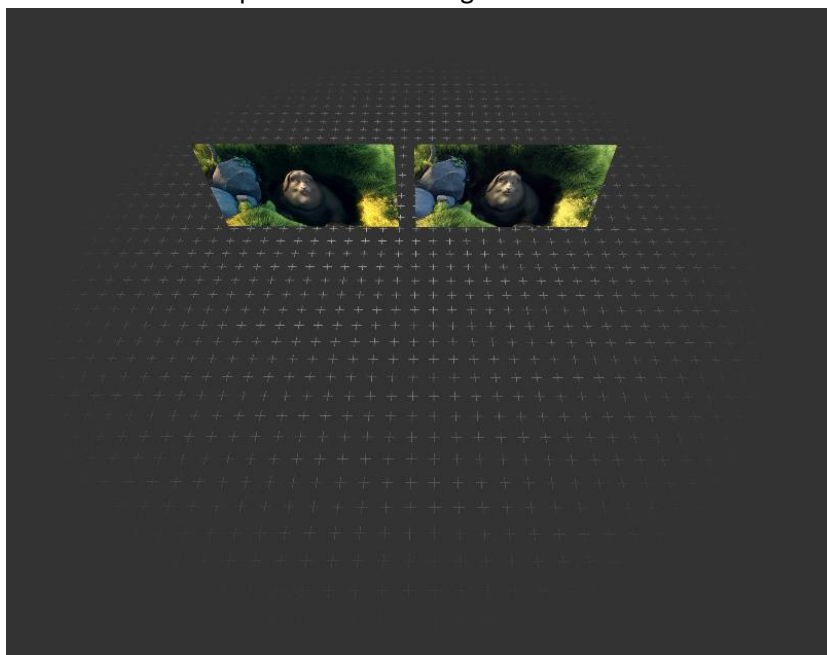
- 09 - Introduction to threejs
- <https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene>
- <https://threejs.org/manual/#en/scenegraph>

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 (XY) all the primitives available in three.js
2. Reproduce these primitives 3 times on the Z 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:

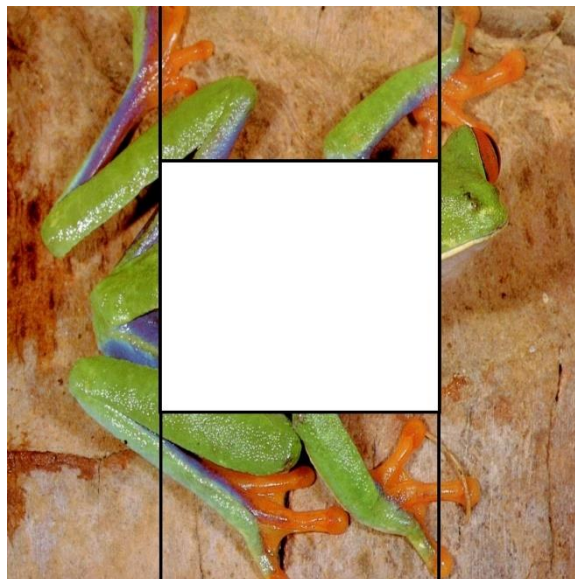
- <https://threejs.org/manual/#en/cameras>
 - <https://threejs.org/docs/index.html#examples/en/controls/FirstPersonControls>
 - <https://threejs.org/docs/index.html#examples/en/controls/FlyControls>
 - <https://threejs.org/docs/index.html#examples/en/controls/OrbitControls>
 - <https://threejs.org/docs/index.html#examples/en/controls/TrackballControls>
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 Boston Dynamics' "Spot" robot (see <https://bostondynamics.com/products/spot/>).



Your 3D model must be identical, and it must be able to move with the same degrees of freedom.

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.