

Assignment 3 : 3D Tangram

To gain full control over how you draw and view your objects, you will now be challenged to move your Tangram application to the 3rd dimension.

With this objective in mind, we have devised a list of requirements to guide and evaluate your project:

Geometry

- Replace your hand-made 2D shapes with 3D shapes created in Blender, exported to file, and loaded into your application with the Assimp library. *Organize the new shapes as it best fits the approach taken in your code.*
- Each shape should have a recognizable and distinct color, slightly modified by the normal vector of each face. *E.g. a shape could be red, with slightly different tints of red on each face. This is important to ensure the volumetry is understandable even without lighting. Implement color as it best fits the approach taken in your code.*
- To manage your scene, use a simple scene graph in which each node has a pointer to the mesh to be drawn, a program shader to be active while the geometry is being drawn and the ModelMatrix to be used for positioning the model.
- *Optional but evaluated (may compensate for other implementation issues):* Implement hierarchical composition in your scene graph, so that nodes consider the configuration of their parent node when being drawn. Select the policies you see as better fitting the approach.

Animation

- Create a second configuration using the tangram pieces. *This new configuration represents the pieces in their box, i.e. a closed square created from the 7 shapes. See Fig.1 for an example configuration.*
- The second configuration should be on a different plane from the first. *As an example, if your first tangram was drawn along the x^z plane, you could draw the closed box configuration along the x^y plane, for instance. You can choose any 2 clearly distinct planes.*
- By pressing the **left** and **right** arrow keys, one should be able to animate the tangram pieces between the 2 configurations (the box configuration and your original tangram configuration). *Pressing the left key will animate until the box configuration is reached, while*

pressing the right key will animate toward your tangram original configuration. You should be able to stop pressing the key at any point, and the animation should stop halfway. You should be able to resume or reverse the animation from that point.

Camera

- Create 2 different cameras, both orbiting around a specific point in space, to which they are always pointing.
- Using the **mouse**, it should be possible to manipulate the position of the camera over a sphere surrounding the origin of the space. Using the **scroll wheel**, it should be possible to get closer or further away from that same origin.
- Use quaternions to prevent Gimbal Lock while manipulating the cameras.
- Using the key '**c**', you should be able to switch between the 2 cameras. *A camera should maintain its state while not active and return to it upon activation.*
- It should be possible to change between an orthographic and a perspective projection by pressing the '**p**' key on the current camera.
- Select the 2 default camera positions so they will facilitate looking at the configurations.
- *Optional but evaluated (may compensate for other implementation issues):* Implement the window resize callback so that the scene is not stretched when the window is resized.



Fig 1. Tangram in a box example configuration