Introduction to Computer Graphics and Animation

Exercise 2 of 5

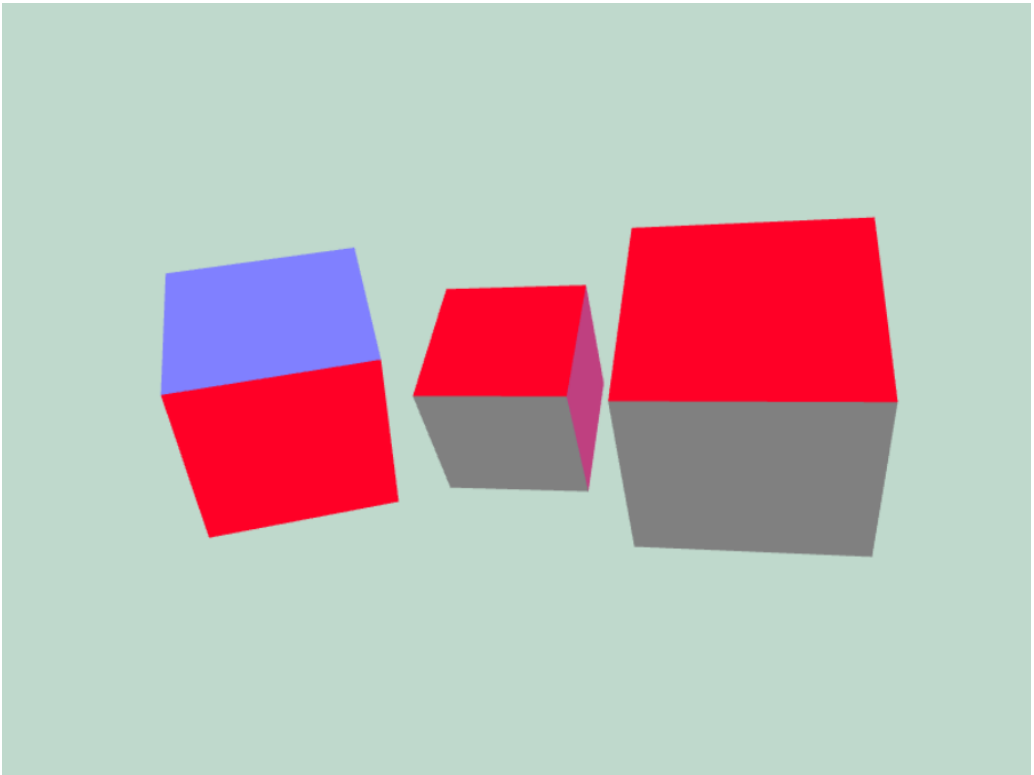
Prof. Dr. Dennis Allerkamp – December 3, 2024

2.1 Cube

In this task, you should draw a simple cube. (Here still without lighting.)

- Generate a vertex buffer with the 3D coordinates of a cube. Give each vertex a color, so that each side of the cube has a different color. (This is important because we don't have lighting yet.)
- Program a vertex shader that passes the vertex colors unchanged and multiplies the vertex positions with the model, the view, and the projection matrices. The matrices are passed as uniform variables to the shader.
- Program a fragment shader that takes the vertex colors unchanged.
- Pass the vertex positions and the colors as attribute variables.
- Generate suitable matrices using the GLM library and pass these as uniform variables to the vertex shader.
- Turn on the Depth Test.
- Draw your cube.
- Repeat the last two steps with different model matrices, so that the cube appears three times in different places.
- Add a simple animation. (For example, a rotation of the cubes around one or more of their own axes.)
- Switch on Backface Culling and repair possibly the orientation of your triangles.
- Change various parameters of the projection transformation and observe the respective effect.

The result of your task could look something like this:



2.2 Fog

In this task, you are supposed to implement a scene in fog.

- As a base, implement a scene with many objects at different distances from the camera (e.g., a grid of cubes).
- Set the clear color to the color of your fog (gray).
- Calculate in the vertex shader the distance to the camera and pass this on as a varying variable to the fragment shader.
- Pass as a Uniform variable a distance `fogNear` before which objects are not in the fog at all and a distance `fogFar` after which objects are fully in the fog.
- If the distance of the fragment is between `fogNear` and `fogFar`, you must mix the color of the object with the fog color, which you should also pass as a uniform, the blending ratio results from the value of the distance.
- Set the values so that they result in a convincing scene of objects in the fog.