Prof. Dr. Reinhard Klein
Richard Vock, Sebastian Ochmann

Universität Bonn
Institut für Informatik II
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Introduction to Computer Graphics
Exercise 5

Practical Exercise *(5 Points)*

View Frustum Visualization

Your task is to implement a 3D visualization of each of the five steps as done in the derivation on the lecture slides and explained in Exercise 4 (it is sufficient to consider the symmetric case).

You are relatively free to decide how this visualization looks like but it should show the geometry of a viewing frustum and ideally some object inside that viewing frustum to see how it gets distorted by the transformation steps; the image below shows an example how the initial scene could look like.

The parameters of the frustum (near, far, aspect ratio, field of view (fov)) should be *adjustable*; example default values are

- near = 1
- far = 3
- aspect = 1.5
- fov = 45 degrees

Also, the visualized transformation step (i.e. only the first step, the first and second step, etc.) should be selectable. You may choose how to make the frustum parameters and visualized step adjustable, for instance using sliders and buttons as seen in earlier exercises.

There is no code provided for this exercise. Simply go to the WebGL playground and choose "New" to start with a new scene. Of course, you may use code from any earlier exercises as reference.

Theoretical Exercise *(3 Points)*

Barycentric coordinates and color interpolation

As you have seen in previous practical exercises, OpenGL interpolates vertex attributes (for instance, colors) linearly between the vertices of primitives (for instance, triangles) when using varying variables to pass attributes from the

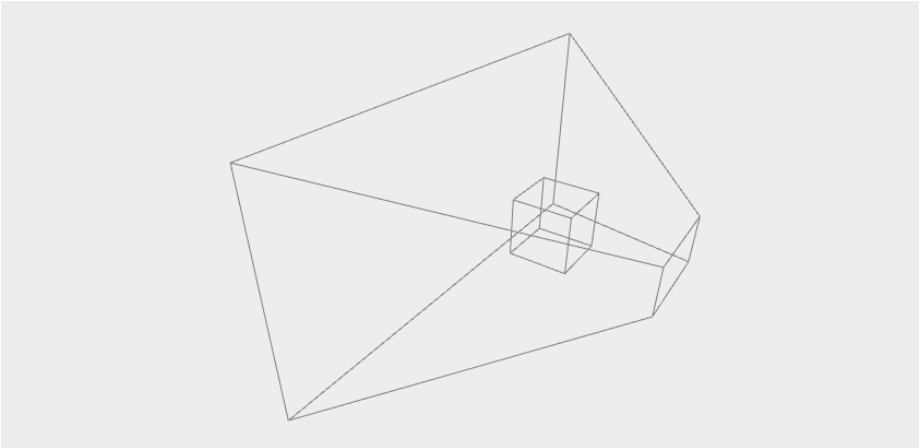

Figure 1: Frustum Visualization

vertex to the fragment shader. In this exercise, you will determine the color value of a point within a triangle which has different colors assigned to its three vertices.

Let $\triangle(v_1, v_2, v_3)$ be a 2D triangle with vertices $v_1 = (0, 0)^T$, $v_2 = (1, 0)^T$, $v_3 = (0.5, 1)^T$. Furthermore, let $c(v_i) = (r_i, g_i, b_i)$ be the RGB color associated with vertex i. The colors for the three vertices are $c(v_1) = (0, 0.5, 0)$, $c(v_2) = (0, 1, 0.5)$, $c(v_3) = (1, 0.5, 0)$.

1. Determine the barycentric coordinates of the point $x = (0.6, 0.4)^T$ (1 point).
2. Using the barycentric coordinates, determine the linearly interpolated color value that should be assigned to point x (2 points).