Computer Graphics, fall 2011

T-511-TGRA

Final Exam

Teacher: **Kári Halldórsson**
Date: **2. desember 2011**
Time: **9:00 – 12:00 (3 hrs)**

Calculator & included formula sheet allowed

Name_____

Kennitala _____

1. **Describe blending (color/alpha blending) in OpenGL (10%)**
   Consider the following questions:
   - Where in the OpenGL pipeline does it occur?
   - What values are used and how?
   - How are these values set and changed?

2. **Describe depth calculations and depth testing in OpenGL (10%)**
   Consider the following questions:
   - What values are used and where are they calculated?
   - Where does the test itself occur and what is it's effect?

3. **Describe per vertex lighting in OpenGL (10%)**
   Consider the following questions:
   - How are different parts of light simulated and how is the final color value added up for each vertex.
   - Where does it happen in the pipeline?
   - What values are used?

4. ModelView Matrix Transformations (40%)

A camera is set up to be positioned in (5,7,4) looking at the point (1,4,2). It has an up vector (0,1,0).

If at any point you have no answer at all to one question needed to continue to the next, use unit vectors and/or identity matrices and add clear explanations for what you're doing.

a) Find the point of origin and vectors for the camera‘s coordinate frame (15%)

b) Set up the ModelView matrix to calculate eye coordinates for that camera (5%)

c) Add to that matrix a translation by (4,3,5) (10%)

d) What are the eye coordinates for the vertex with world coordinates (-3, 1, -3)? (10%)

5. Clipping (10%)

A 2D window has the values:
W(left, right, bottom, top) = (-150, 500, -350, 200).
Use the Cohen-Sutherland clipping algorithm to clip a line with endpoints (-300, 0) and (600, 300) against the window.

6. Window-2-Viewport mapping (10%)

In which pixels on a 1024x768 viewport (bottom left corner (0,0)) will the endpoints from the previous example (5. Clipping) be rendered?

Use clipped endpoints unless you have no answer to 5. In that case use original endpoints (chancing an impossible result).

7. Rasterization (10%)

Three vertices of a triangle have been sent through the OpenGL pipeline. Their pixels and greyscale color values are:
P1: (3,4) - c1: 0.3
P2: (8,5) - c2: 0.7
P3: (6,1) - c3: 0.6

After shading the whole triangle what will the color value be in pixel (5,3)?

Bonus 3%
In which movie does the following dialog occur?
Who is character A?
Who is character B?

A: We've been having a bad day.
B: Hmm... Hey, I might not be a doctor, but I know that there's no better cure for a sour face than a couple of boards and some choice waves. Whatcha think?
(Ég er enginn læknir en ég veit að ekkert læknar deyfð og döpur fés eins og vel valdar öldur og þokkaleg bretti)