CPSC 314 2013W T2 Review 3

April 17, 2014

Please also take a look at the earlier review questions available on the course resources page.

Projector Texture Mapping

A projector is at $(5, 3, 3)$ looking at $(5, 3, -3)$. The near plane is at $z = 2$. The left and right of the rectangle in the eye frame are at $x = -1$ and $x = 1$. The top and bottom of the rectangle are at $y = 2$ and $y = -2$. Construct the model-view matrix and the projection matrix. If the texture in Figure 1 to be projected is shown in the picture, what is the colour to be projected on the point at $(9, 4, -10)$?

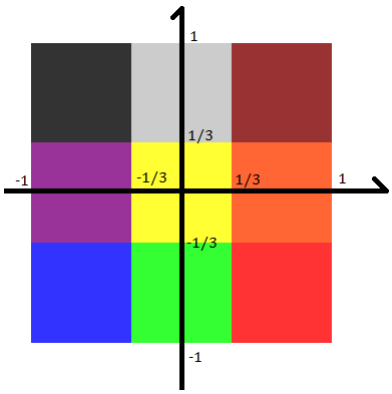

Figure 1

Interpolation

The control points for a Bézier curve are: $C_0 = (0, 0, 0)$, $C_1 = (2, 5, 3)$, $C_2 = (5, 1, 3)$, $C_3 = (0, 2, 3)$. What is the point at $t = 0.5$?

Depth

The near plane is at $z = -5$, the far plane is at $z = -20$, the top, bottom, left and right of the near plane are at $y = 6$, $y = -6$, $x = -10$, $x = 10$. Construct the projection matrix. What are the clip coordinates of the points $P_1 = (2, 2, -6)$, and $P_2 = (3, 3, -15)$? What is the depth value that would be stored in the depth buffer, for each point?

Sampling

A single fragment is shown in Figure 2, along with the colours from a texture image that would map on to it. Suppose we use over-sampling at points $P_1 = (0.4, 0.6)$, $P_2 = (0.3, 0.3)$, $P_3 = (0.2, 0.7)$, what is the output colour? What if the sampling points are 9 points on a 3 by 3 grid at $x = 0.25, 0.5, 0.75$, and $y = 0.25, 0.5, 0.75$? Assume the colours for red, green, blue are $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$ respectively.

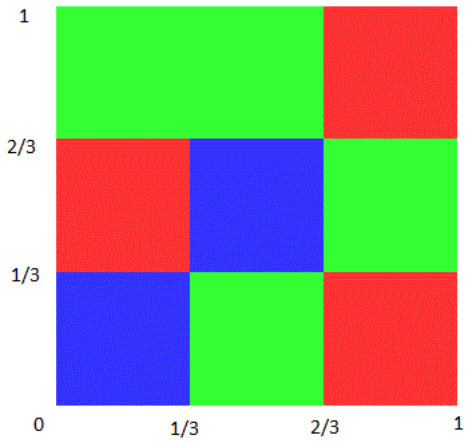

Figure 2

Compositing

On a completely opaque black background, with colour (0,0,0,1), we draw a foreground fragment with the colour (1,1,1,0.7) i.e. white with alpha value 0.7. What is the output colour of the pixel?

Bilinear interpolation

If the value at P1 = (1,1) is 0, P2 = (2,1) is 1, P3 = (2,2) is 1, P4 = (1,2) is 1. What is the bilinearly interpolated value at P5 = (1.5,1.5)? What if P5 was (1.25,1.75)? What if the value at P3 is 2?

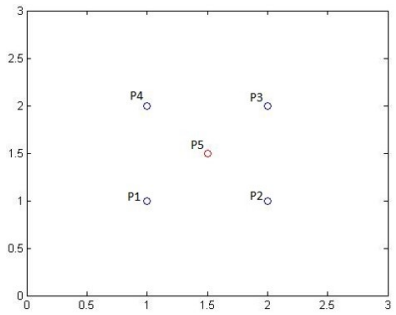

Figure 3

Assignment Related Questions

1. What does the following line of code do?

```
glUniform3fv(glGetUniformLocation(w_state->getCurrentProgram(), "gem_pos"),
     1, glm::value_ptr(gem_position));
```

2. In assignment 1, we asked you to deform the armadillo by the following scheme: If a given vertex of the armadillo is within gem_radius of gem_position, translate it along the vector between it and the gem until it lies on the surface of the sphere. You are given the following:

```
vec4 Position;

uniform vec4 gem_position;
uniform float gem_radius;
```

Fill in the important pieces of the vertex shader below:

```
//...
int main()
{









}
//...
```