Edinburgh Napier UNIVERSITY

Computer Graphics

SET08116

Revision Questions

Lighting

Describe the following 3D lighting techniques:

- Ambient
- Diffuse
- Specular

Describe per-vertex (Gouraud) and per-pixel (Phong) shading and the differences in how they're calculated

What are the equations for:

- Ambient
- Diffuse
- Specular

Given the below values, calculate the vertex colour:

Vertex position <1,2,-3>
Vertex normal < 0,1,0>
Light colour (ambient) <0.1, 0.1 ,0.5, 1.0>
Light colour (diffuse & specular) <0.7,0.7,0.7,1.0)
Material colour (all) <0.5,0.5,0.5,1.0>
Shininess <0.5>
Light vector <0,0,1.0>
Eye position <0,0,0>

Scene/Visibility

Explain what frustum culling is and how it can improve rendering performance.

Give the following camera parameters, calculate the frustum planes:

Near <2.41>
Far <1000>
Screen width <1280>
Screen height <720>
Horizontal field of view ($\frac{\pi}{4}$)

Is the point given by <-2,-100,-300>, visible to the camera?

Why is the graphical pipeline good at processing data in parallel?

How does vertex data sent to the graphics card to exploit parallelism and the graphics pipeline?

Generate the following transformation matrices:

- Translation <10,20,50>
- Scale <1,2,3>
- Rotation about x-axis (pi radians)
- Rotation about z-axis (pi/4 radians)

Calculate the final transformation matrix (i.e., combining them)

Apply the transformation matrix to the following points:

- <-1,2,0>
- <5,2,1>
- <-1,-1,1>
- <1,2,3>

Texturing

Describe how texturing is performed on a 3D object.

Explain mip-mapping and why it is important in texturing?

Describe four texture projection techniques
(ans: spherical, cylindrical, planer, natural, ..)

What do we mean by procedural textures and give an example.

Matrices

Given a 2x2 matrix how do you calculate the determinant?

Given a 3x3 matrix how do you calculate the determinant?

Given the 3x3 matrix:

```
[4  0  7]
[0  3  5]
[0  0  1]
```

calculate the determinant.

Explain the Gauss-Jordan Elimination technique.

Other

Explain the Barycentric coordinates of a triangle and derive the equation.
Explain basic scene organisation and subdivision/collision detection.
Describe what a Scene Graph is and discuss how it's useful for complex scenes.