EECS-376 Practice Quiz 2

Note: the real quiz will not be anywhere near this long.

Question 1

Describe how to set a breakpoint on Unity using whichever IDE you use.

选中要断点的地方。在行号左侧的地方用鼠标点击一下，出现红色圆圈之后。

Question 2

Why do we use triangles to model shapes in 3D?

1. triangle能够form各种polygon， polygon能够make a piecewise-planar approximation to any surface, and piecewise planarity is nice because planes are linear so as interpolating between them, intersection between them an so on. Most importantly, GPU is good at computing linear functions.
2. GPU is good at computing linear functions.

Question 3

Here's an equation for the brightness of a pixel given position **r** of the patch of surface being imaged, the direction **L** of the light ray that's hitting the patch of surface, and the surface normal **n** of the patch:

$$brightness = A + B(\mathbf{L} \cdot \mathbf{n}) + C\left(\mathbf{L} - 2\big(\mathbf{n}(\mathbf{L} \cdot \mathbf{n})\big)\right) \cdot \mathbf{r}$$

All vectors here are assumed to be in camera-centered coordinates, and to keep things simple, we're assuming this is just in black and white so the result is one number, a brightness. The three constants A, B, and C control the amount of diffuse, specular, and ambient light. Which one controls which? That is, which of the terms in the above equation are the ambient, diffuse, and specular terms?

R = **L - 2(n(L·n))) = reflection ray, so C controls specular light.**
cos ø = L·n, so B controls diffuse light
A is constant, so it controls ambient light

Question 4

If you're displaying a model using Phong shading and a texture map, what information needs to be specified for each vertex, besides its position in space?

1. color information;
2. normal information
3. **texture coordinates**

Question 5

Why do we have to draw transparent surfaces from back to front?

Because alpha blending is not commutative, so the order is important.

Question 6

What is the separating axis theorem? Why do we care?

That is used to see if two convex objects intersect or not, if not, there must be a axis connect both and a line to separate them.
Because it's the basis of all collision detection schemes, and that's why we have to decompose concave objects into convex parts to do collision detection.

Question 7

Give a situation in which static collision detection will miss a collision and continuous detection will detect it.

子弹打墙壁的故事

Question 8

What coordinate systems (object, world, camera, and screen) do each of the following matrices map? Give your answers in the form "X coordinates to Y coordinates":

- The projection matrix
- The model matrix
- The view matrix

1. camera coordinates to screen coordinates
2. object local coordinates to world coordinates
3. world coordinates to camera coordinates

Question 9

What's a good heuristic function for path planning in 2D?

To choose the smallest Euclidean distance

Question 10

In the Spore behavior tree system, what's the difference between the Decide() function and the Tick() function?

Decide() determines whether a node wants to start running. Tick() is called when the node is running and its returns value determines whether to stop running.

Question 11

Your GPU's frame buffer stores the Z coordinate from which every pixel is imaged. Why?

when draw a picture, in this way can it ignore those pixels hidden by the pixel in front of them.

Question 12

Why is it expensive to switch from one shader to another while rendering?

1. It needs CPU to send a new batch, which is expensive cost.
2. It needs GPU to empty its pipeline which is also expensive.

Question 13

Your friend is making a space flight simulator and is representing 3D position as a combination of translational position and a unit vector in the direction the ship is pointed. Why is this not even a valid representation of 3D pose?

It cannot represent the rotation in itself direction.

Question 14

What are the disadvantages of rotation matrices as a representation of rotation?

1. cost larger space
2. still cannot be interpolated.