
1. (10%) Despite its weaker graphics capability than PS3 and XBox 360, Nintendo Wii machine has gained more popularity than its competitors. Please give your explanations on this fact. Why?

2. (20%) If one object bumps into another object, it is called "Collision Detection". Why is it a basic and important component of interactive computer graphics?

(a) (5%) Please give two examples or applications which use collision detection algorithms.
(b) (5%) Given one object with N triangles in 3D space, and another with M triangles, what is your simplest algorithm (brute force algorithm) for collision detection? What is its complexity in computation?
(c) (10%) Can you think of a much better way for fast collision detection? Please describe it and show its computational complexity.

3. (5 %) What is your term project for this semester? What are the technical difficulties involved in the project? (You can refer to the project listing).

4. (15%) (a) Painter’s algorithm draws polygons from back to front. Give an example where painter’s algorithm fails. (b) BSP tree is an algorithm to address the problem painter’s algorithm faces. Construct the BSP tree for the following figure. Use face 1 as the root. (c) What is the display sequence if the eye is placed in the position before face 3 and 2, but at the back of face 5.

5 (20%)
(a) (10%) Please describe the traditional graphics pipeline, and explain what is done in each stage.
(b) (5%) Can you realize Phong shading by traditional graphics pipeline?
(c) (5%) What is GPU? Can it be used in Phong shading? Why?

6. (20%) Polygon rendering.
(a) (5%) What is the advantage of using polygons for rendering, instead of using curved surfaces, or solid modeling (such as spheres and boxes).
(b) (5%) What is the advantage of using curved surfaces for rendering? How to display it efficiently in practice?

(c) (10%) As shown in the following figure, in perspective projection the silhouette (point B) of the polygon would be invisible. Discuss this problem (how it happens and how to cure it), where N1 is the surface normal at A, and N2 is the surface normal at B. E is the eye position.

7. (10%) There are nice properties about Ray Tracing. Please describe the strength and weakness of Ray Tracing, using the theory of “The Rendering Equation”