

Computer Graphics

Review questions

1. Foley 14.2
2. Show that if the number of subsegment in a BSP is k , then the total number of nodes in BSP is $O(k)$. Hint: Prove a correlation between the number of nodes and leafs in a binary tree with the property that no nodes of F has single child.
3. Let T_1 and T_2 be two quad trees, representing two shapes S_1 and S_2 respectively. Write a function that accepts the roots r_1 and r_2 of T_1 and T_2 , and return the root of a quadtree T_3 representing $S_1 \cup S_2$.
4. Explain how to find a cubic curve passing through the points p_1, p_2, p_3, p_4 in the plane.
5. Let a, b, c be three points in the plane. Show how to find two Hermite curves, H_1, H_2 , where H_1 connecting a and b , H_2 connecting b and c , (1)the curve resulting from the concatenation is in C_1 their concatenation is in C_1 , and its derivatives at a and c equals to given vectors.
6. Explain how to perform certain operations in the box world project.
7. Explain how to combine the Gouraud Shading model with bump map $\sin(\pi x + \pi y)$.
8. Explain the effect of chainging n in formula (14.15) (page 486) of Folly.

————— A few more questions —————

9. The question refers to the technique for viewing implicit functions described in slides "14_raytracing" slides. How would you set the voxels to describe $\Sigma(c)$ if $f(x, y, z) = x^2 + y^2 + z^2$? What would be the setting of the voxels if $f(x, y, z) = x + y + z$?
10. A *balanced octree* is a quadtree at which for every two neighbouring quadrants q_1, q_2 , the size of q_1 is at least half the size of q_2 . Balanced octrees are used very frequently in practical applications. Describe the advantage of balanced octree (compared to "standard octree") for ray tracing applications.
11. Draw a small surface consisting of a few triangles, and describe the widge data structure for this surface.
12. suggest an *efficient* algorithm for the following problem: Given a set of triangles in 3D, see how many triangles are stabbed by each ray shoot through a pixel of your screen. Assume orthogonal projection.
13. How would you modify your box-world program in order to enable specular reflection, with some ambient light, with one source of light. Using Phong model with $n = 400$, and make use in your implementation that n is very large.