

Quiz #4 (CSE4190.410)

December 1, 2014 (Monday)

Name: _____ Dept: _____ ID No: _____

- (10 points) In rendering opaque polygons using the graphics hardware depth-buffer, it is not necessary to render the polygons in an exact back-to-front or front-to-back order. Nevertheless, for a scene stored in a hierarchical spatial data structure, a suitable ordering of polygons is useful for improving the rendering performance.
 - Discuss how to render a polygonal model stored in a BVH tree.
Answer: Compare the depths of child BV node centers. Render first the subtree with a smaller depth, and then the other subtree.
 - Discuss how to render a polygonal model stored in a BSP tree.
Answer: Render first the subtree that contains the eye position, and then the other subtree.
- (10 points) Discuss an algorithm for converting a sphere environment map to a parabolic environment map?

Initialize all (u, v) with black. Then, to each (u, v) with $(2u - 1)^2 + (2v - 1)^2 \leq 1$, assign the sphere map image at (u_s, v_s) :

$$\begin{aligned}(x_p, y_p) &= (2u - 1, 2v - 1) \\(r_x, r_y, r_z) &= (2x_p, 2y_p, \pm(x_p^2 + y_p^2 - 1)) / (x_p^2 + y_p^2 + 1) \\(x_s, y_s) &= (r_x, r_y) / \sqrt{r_x^2 + r_y^2 + (r_z + 1)^2} \\(u_s, v_s) &= (x_s + 1, y_s + 1) / 2.\end{aligned}$$

The assignment is to the front (resp., back) parabolic map if $r_z \geq 0$ (resp., $r_z < 0$).