Fall 2008 Written Assignment 2
CS 4160 - Computer Graphics
Columbia University

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Instructions:
Note also the due date for the assignment (due to TA or instructor by Dec 11, 5pm)
You need to do the assignment individually without collaboration.
There are four questions.
You may use any notes, slides or printed materials.
State all assumptions and show all work to get partial credit.

1. Ray-Surface Intersection

(a) Explain how to intersect a a ray with a triangle in ray tracing?

(b) Now, explain how to intersect a ray with a general implicit surface?

(c) Finally, explain how to use your optimized ray-implicit surface intersection code to intersect a ray with a transformed surface (assume points on the new object are obtained by some transformation applied to points on the original implicit surface)?

2. Rendering Equation

What is the rendering equation? Derive one version of it.

3. Radiosity

What is the radiosity equation? Make the appropriate approximations to derive it from the full rendering equation.

4. Recursive Ray Tracing

(a) What is standard (whitted-style) recursive ray-tracing? What visual effects does it allow for, that are hard to achieve in OpenGL?

(b) Write down some simple pseudocode for the basic algorithm?

(c) In what way is recursive ray tracing an approximation to the rendering equation in question 2?