

CIS 560 Quiz 5 - Raytracing and Bounding Boxes

Question 1

What is the benefit of performing backwards ray tracing as opposed to forwards ray tracing? Answer in at most two sentences.

By casting rays from the camera into the scene, we use the minimum number of rays necessary to compute the light reaching the camera. No need to solve what rays of light leaving light sources would hit the camera since you're tracing those rays already by casting them from the camera.

Question 2

Why does Lambert's Cosine Law, which says that the radiant intensity observed at a point on a diffuse surface is proportional to the cosine of the angle between the surface normal and direction of incident light, hold true? Answer in at most two sentences.

As the angle between the normal and light source approaches 90 degrees, the area over which the light is projected increases such that the light leaving the light source is diffused over a larger and larger area, leaving any particular point in the illuminated area progressively less bright.

Question 3

List a benefit and a drawback of the following anti-aliasing techniques:

Uniform super-sampling:

Benefit: Quick to perform

Downside: Does not avoid causing visual artifacts such as Moiré patterns

Random super-sampling:

Benefit: Does not cause visual artifacts

Downside: No guarantee that all samples won't be in the same area of the pixel

Poisson-disc super-sampling:

Benefit: Prevents visual artifacts and is guaranteed to sample a range of areas over the pixel

Downside: Costly to compute the sample distribution

Question 4

In the context of your raytracer homework code, is an axis-aligned bounding box easier to compute than an object-aligned bounding box for a mesh? Would using an axis-aligned bounding box be more efficient for intersection testing? In no more than two sentences, explain your answer.

In the context of the homework, it is not easier to compute the AABB than it is to compute the OABB; you already have the untransformed vertex data stored in the Mesh class. The efficiency of the AABB depends on the shape of the mesh; if it is close to a rectangular prism in shape then the AABB and OABB are more or less equivalent.

Bonus Question

A wild GRAPHICS QUIZ blocks your path! It flaps its pages at you menacingly while brandishing a triangular plane in the manner of a knife. How do you respond?

I use the zero matrix to transform the quiz into a single point in space. With a wave of my hand, I create a small gust of wind and the quiz goes flying away. I guess you could say that I *rendered* the quiz helpless!