AIT-BUDAPEST

AQUINCUM INSTITUTE OF TECHNOLOGY

COMPUTER GRAPHICS

Homework assignment example

RAY TRACING

Background:

Students received this assignment after practical sessions where they have already implemented ray tracing spheres with shadows and reflections. They had to implement ray intersection for somewhat more complex geometry, and make creative use of tweaking the ray tracing process for various effects.

The assignment text was as follows:

Write a C++ program that renders an image using ray tracing and displays it using OpenGL.

The image should depict various types of Easter eggs and other paraphernalia, from the following list:

- the golden egg: A quadratic surface with ideal reflection. Use the Fresnel formula approximation for a golden look. You might also throw in a copper and a platinum egg for comparison. Make sure a number of other objects are reflected.
- the painted egg: A quadratic surface with 2D procedural texturing.
- the marble egg: A quadratic surface with 3D procedural texturing. Use the Perlin noise function to get a marble look.
- the chocolate egg missing a bite: A solid obtained as the regular difference of two quadratic objects (the egg and the missing bite). The outer surface should have Phong-specular reflection, the inside surface, Lambertian. The intersection method should compute all intersections with both the egg and the bite sphere, and figure which of those is the actual hit.
- the carved egg: A quadratic surface with a 2D procedural mask for transparency. Intersection points where the surface is transparent (carved away) should be discarded. You may place another object within the egg for added effect.
- the horseshoed egg: A quadratic surface with a 2D procedural relief map, with extrusions in the shape of horseshoes. This is a task for worth two picks.
- the glass egg: A quadratic object made of ideally refractive material.
- the bunny: Must have long ears. Use any raytracable primitives an material models you see fit.
- fluffy clouds: A cluster of quadratic surfaces. Use any primitives, material models, and colorful lighting.
- an open can of paint: A silver cylinder with its top transparent, with a surface of red paint visible inside.
- Chicken: Must have a cone (also a quadratic surface) for a beak.
- the glowing egg: Has own emission, doubles as a positional light source.
- the cube: Simplest to implement as a regular intersection of six half-spaces (i.e. delimited by six planes).

You must feature:

6 of these for A+

5 of these for A

4 of these for B

3 of these for C

2 of these for D