Ray Tracer Project

CSE 557

Ray tracing

- Ray tracing lets you make very realistic renderings
- Can model many different phenomena: shadows (hard and soft), reflection, refractions, caustics, depth of field, motion blur, etc.

Starter code

- 9.5k lines of code that includes:
  - Parser for the file format
  - Linear algebra classes
  - UI/command line parameters
  - Classes for camera, lights, materials, rays, and scenes
  - Object classes: box, cone, cylinder, etc.

File format

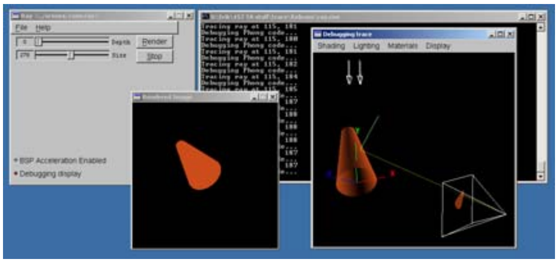
```
SBT-raytracer 1.0

camera {
            position = (0,0,-2);
            viewdir = (0,0,1);
            aspectratio = 1;
            updir = (0,1,0);
}

directional_light {
            direction = (0, 0, 1);
            colour = (1.0, 1.0, 1.0);
}
```

```
rotate(1,1,1,1.5,
box {
            material = {
                        diffuse = (0.8,0.8,0.3);
                        transmissive = (0.5,0.5,0.5);
                        // specular = (0.3,0.3,0.3);
                        index = 1.3;
            }
})

scale(0.707106781187,
            sphere {
                        material = {
                                    diffuse = (0.5,0.5,0.9);
                                    transmissive = (0.9,0.9,0.9);
                        index = 1.8;
                        }
            }
)
```

Linear algebra

```
Vec3d v1(0, 1, 2.5), v2;
Mat4d m;
double d = 3;

v2 = d * v1;
v2[2] *= -1;
d = (v2 * v1);
m[0][1] = 2;
v1 = m * v2;
```

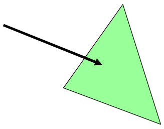
UI



```
Tracing ray at 115, 181
Debugging Phong code...
Tracing ray at 115, 180
Debugging Phong code...
Tracing ray at 115, 181
Debugging Phong code...
Tracing ray at 115, 182
Debugging Phong code...
Tracing ray at 115, 184
Debugging Phong code...
```

Requirement #1

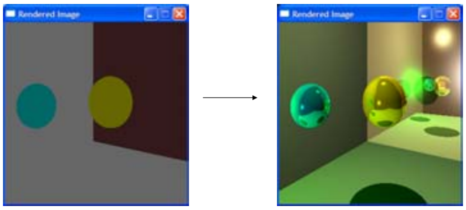
Triangle-ray intersection



1. Hit or not?
2. If hit, find barycentric coordinates of intersection

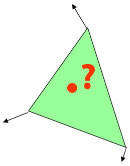
Requirement #2

Illumination model



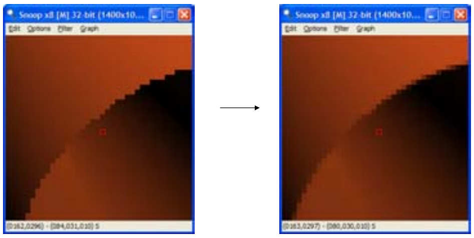
Requirement #3

Phong interpolation of normals for triangle meshes



Requirement #4

Anti-aliasing


Snoop x8 [M] 32-bit (1400x10...
Edit Options Filter Graph
Snoop x8 [M] 32-bit (1400x10...
Edit Options Filter Graph

Requirement #5

Acceleration

Rendered Image

Over 50k triangles

don’t need to check them all when rendering this part!