

CSC418 Assignment 3 Wooden Monkey Report

Philip Lee - 999074932 (c5leephi)

This program implements a forward raytracer. Multiple rendering features were added to emulate photorealistic scenes. Phong shading is used as a local illumination model. Three different primitive shapes are supported including spheres, planes, and cubes. These primitives can be affinely transformed to change their position and orientation within the scene.

The program structure is as follows:

- Textures are stored in textures folder
- Results of initial Phong shading demonstration can be found in sig1, sig2, diffuse1, diffuse2, phong1, phong2
- Intermediate results throughout the project are stored in the progress_results folder
- Submissions for the Wooden Monkey are woodenmonkey1, woodenmonkey2, and woodenmonkey3. They are described in the following table.

Submission File	Description
woodenmonkey1	Semi transparent glass piece embossed with Starry Night by Van Gogh. Demonstrates directional lighting, textured cubes, and semitransparent glass with coloured shadows.
woodenmonkey2	Reflective spheres with planet textures arranged in a triangle. Demonstrates spherical texture mappings, multiple reflections, soft shadows, planar textures.
woodenmonkey3	Two spheres being observed through a glass sphere. Demonstrates refraction, depth of field.

Features that were implemented are described in the following table.

Feature (From Assignment List)	Description
Anti-Aliasing	Removes edge effects by sampling rays multiple times per pixel.
Depth of Field	Simulate a camera aperture that is not a point. Obtained by rendering the scene multiple times about the focus point.
Extended Light Sources for Soft Shadows	Light sources are stochastically sampled as an area light to generate shadow gradients.
Refraction	Simulates bending of light due to material properties.
Textured Spheres, Cubes, Planes	Maps a 2D texture to a 3D primitive.
Multiple Reflections	Follows a ray over multiple specular bounces..

Feature (Not From List)	
Spotlight Directional Lighting	Simulates a spotlight by generating a gain function for the lighting that varies with the angle of illumination.
Multi-Threading Using Boost	Partitions rendered image into segments that can be individually tackled by different threads.
Semitransparent Glass	Material that provides it's own colour as well as shows the colour of the object behind it.
Coloured Shadows	Light passing through a semitransparent object casts a coloured shadow.
Unit Cube Primitive	Ray intersection for a unit cube existing in 3D space.

External resources that were used in this project are described in the following table:

Resource	Description
Textures	<p>Texture maps were found online from a variety of sources.</p> <ul style="list-style-type: none"> • Planet maps were found on http://planetpixelemporium.com/planets.html • Galaxy texture was found on deviantart at http://lyshastra.deviantart.com/art/Free-Space-Galaxy-Texture-435789256 • Most material textures were found using http://textures.com • Classic paintings were generated using Google image search
Boost Library	Boost library was used to enable multithreading.
Refraction	<p>Formulas for calculating refraction angles are succinctly described in the following resource:</p> <p>http://graphics.stanford.edu/courses/cs148-10-summer/docs/2006--degreve--reflection_refraction.pdf</p>