CSC305 Assignment One
Due Date: 3 February 2018

January 2018

1 Introduction

In this assignment you will write a simple ray tracer. The core requirement is to write a ray tracer that minimally ray traces a sphere from a fixed point of view. To improve your grade you can add rendering features such as mirror reflections, shadows, anti-aliasing, etc. A list of possible improvements is provided below. Other enhancements are possible and will be considered, but it is best to consult the TA/Instructor first!
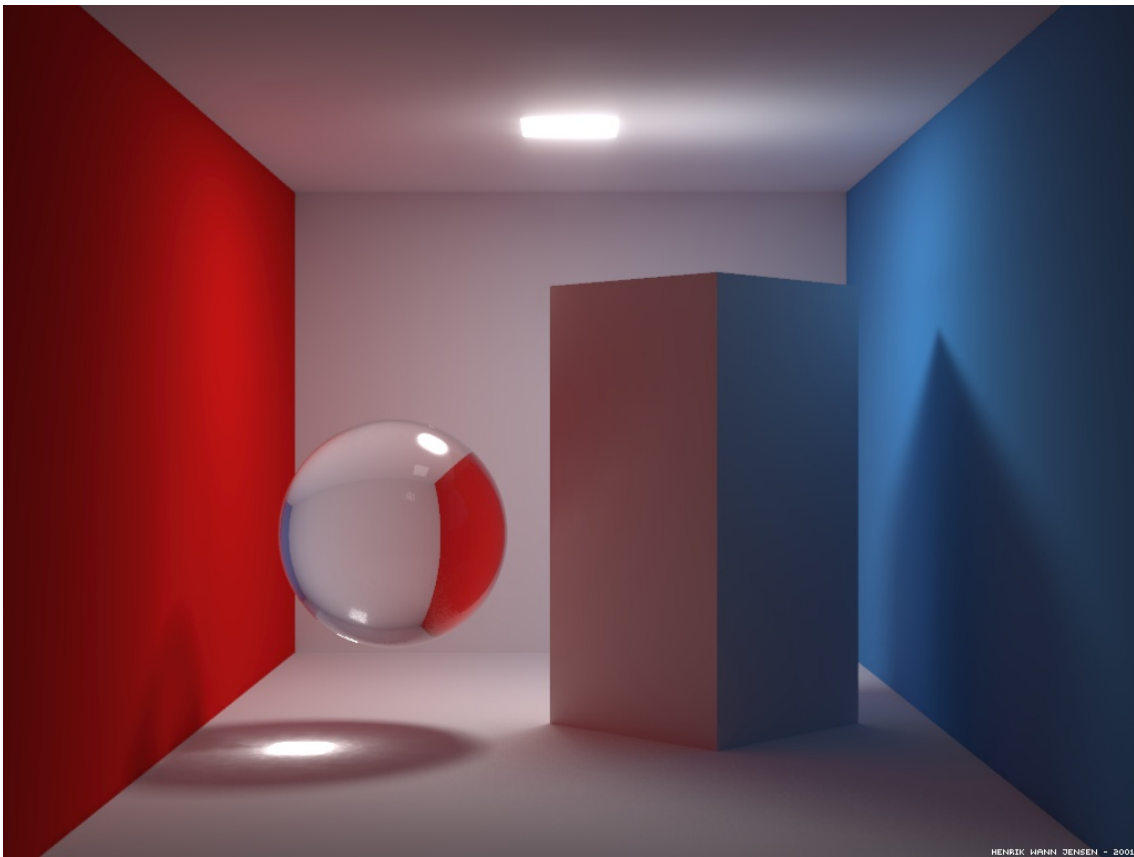

Figure 1: A high-quality ray traced image of a Cornell Box. Image credit: Dr. Henrik Wann Jensen, UCSD. 2001.

1.1 Basic Functionality (70%)

The program compiles and renders:

- One sphere

- A single point light source and fixed point of view

- The floor of your scene (i.e. ray-plane intersection) with a given surface material (i.e. Phong shading model)

- Cast object's shadows in the scene

In the demo session, demonstrate how to change rendering parameters (e.g. light position, color, material parameters).
Note: No user-interface is required, during the demo simply modify the sources and re-compile/run.

1.2 Advanced Functionality (5% - 60%)

Include in your implementation any combination of the following features to better your assignment grade:

Modeling

- Create a Cornell Box scene (i.e. ray-quad intersections) (area light not required) (5%)

- Add ability to trace a triangle mesh (i.e. ray-triangle intersection and .obj file format) (15%)

Rendering

- Develop a reflective material for the sphere or other object (10%)

- Develop a refractive material for the sphere or other object (10%)

- Ability to add a texture to your geometry (5%: 2% checkerboard + 3% from image)

- Implement alternative light types (e.g. area light) (10%)

- Cast more rays to anti-alias the image (5%)

2 Grading

Prepare a short written report of which features you have implemented, and be ready to answer questions.
You are expected to be able to explain your code and how it works.
During grading you will have 3 minutes to show your ray tracing program and its features to a TA.
The program can be compiled and run on either the ECS354 lab machines or your own machine.
Make sure you are able to do so smoothly before the grading session.

3 Helpful Resources

- Chapter 4 of "Fundamentals of Computer Graphics 4ed"

- "Ray Tracing in One Weekend" and/or "Ray Tracing: The Next Week"