# CSE306 Assignment 1

# RayTracer



May 10, 2021

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# 1   Introduction

During this project, I implemented the following features:

- Direct lightening and shadows for light sources

- Diffuse, mirror ,refractive surfaces, and Fresnel's law

- Indirect lightening for point light sources

- Antialiasing

- Ray mesh intersection including BVH

In this report, I will mainly illustrate the rendered images after implementing each of the above features.

# 2   Direct lightening and shadow computing:

I started by defining my classes and operators for handling geometric computation as well as defining a scene and computing the direction of rays in addition to the intersection between a ray and a sphere and between a ray and the scene and finally added the shadow computing in order to obtain the following rendered images on diffuse, mirror and transparent surfaces:
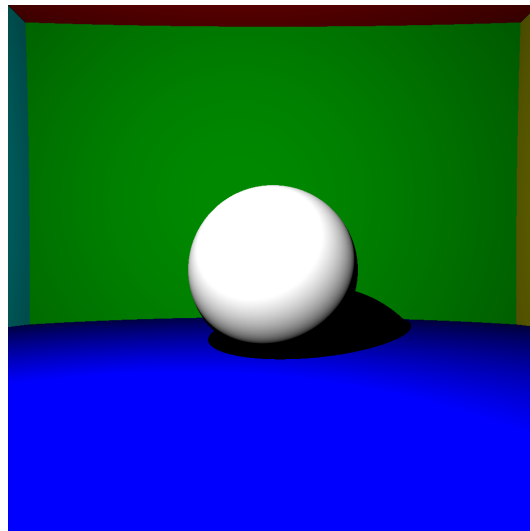
## 2.1   Diffuse Surfaces:



Figure 1: 512×512, 16439 milliseconds

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## 2.2 Mirror and Transparent Surfaces with Fresnel's law:

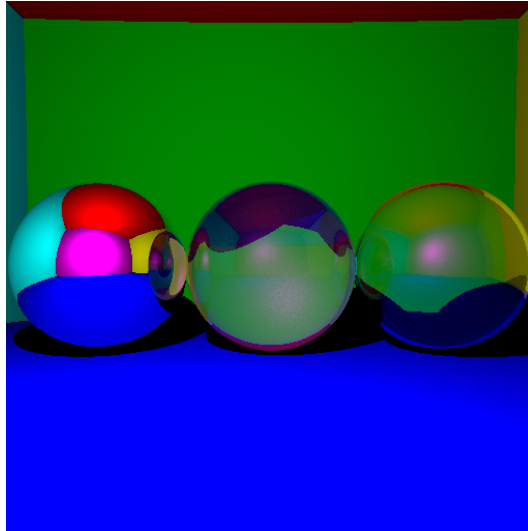

Figure 2: 512×512, 33918 milliseconds

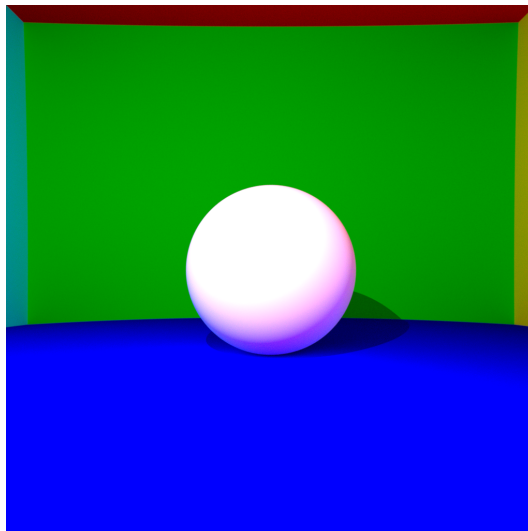# 3 Indirect lightening and Anti-aliasing

## 3.1 Diffuse Surfaces:



Figure 3: 512×512, 156741 milliseconds

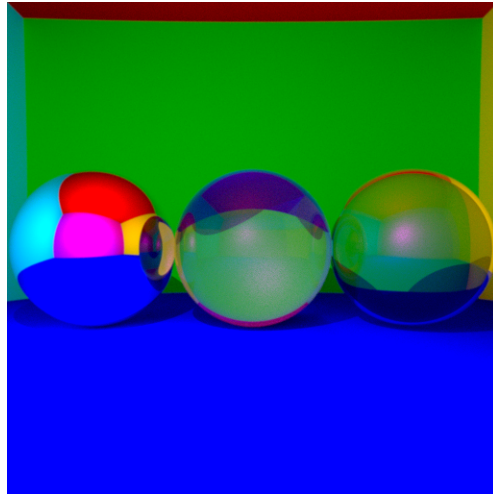## 3.2 Mirror and Transparent Surfaces with Fresnel's law:



Figure 4: 512×512, 163873 milliseconds

# 4 Ray mesh intersection with direct and indirect lightening along with Anti-aliasing
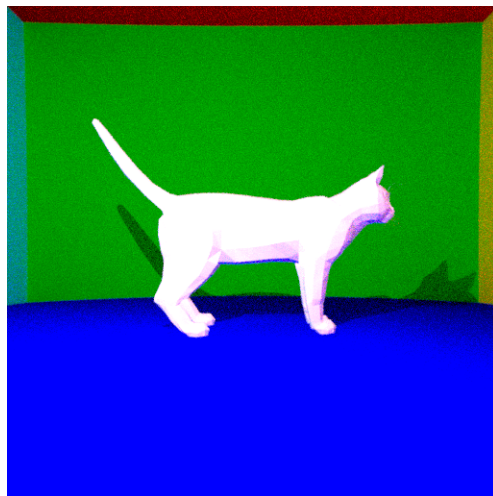
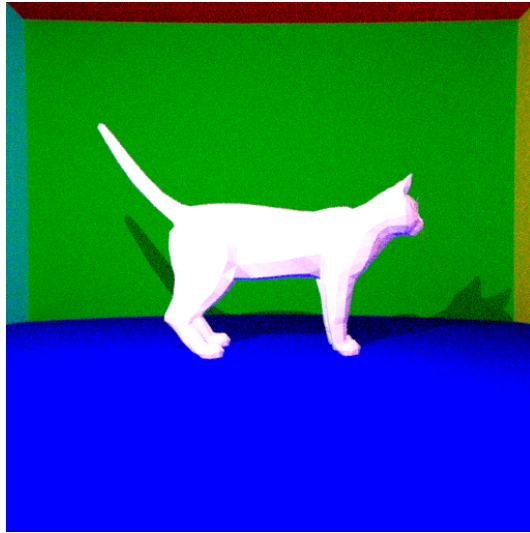## 4.1 Single Box Bounding



Figure 5: 512×512, 267456 milliseconds

## 4.2 BVH



Figure 6: 512×512, 248567 milliseconds