CIS-461-2019 / **homework-02-recursive-ray-tracing-tatran5** Private

homework-02-recursive-ray-tracing-tatran5 created by GitHub Classroom

2 commits **1** branch **0** releases **1** contributor

Branch: master ▾ New pull request Create new file Upload files Find file Clone or download ▾

imyself updated readme link Latest commit `e3c58c1` a day ago

2lightsSimple.png	base files	a day ago
README.md	updated readme link	a day ago
cb.png	base files	a day ago
cornell_box.json	base files	a day ago
cornell_box_2lights_simple.json	base files	a day ago
reflection_refraction.json	base files	a day ago
specular.png	base files	a day ago

README.md

Ray Tracer Part II

University of Pennsylvania, CIS 561: Advanced Computer Graphics, Homework 2

Overview

You will extend the ray tracer engine you have made thus far to perform basic ray tracing operations, including the computation of specular ray reflections and specular ray refractions.

`Light` and `PointLight` Classes (20 points)

Write a general `Light` class to represent light sources, and have `PointLight` inherit from it. Next week we will add area lights in addition to point lights. Your `Light` class should have the following members:

- A `Color3f` representing the light's hue and intensity. This means the color values may be greater than 1 if the light is brighter.
- A function that, given an `Intersection` in the scene, determines if that `Intersection` can see the `Light` (i.e. a shadow test).

`Material` Class (10 points)

You will write a class that represents a general surface reflection/transmission model, which will be inherited by several different classes. Your `Material` class should declare the following members:

- A purely virtual function `GetScatteredColor` to compute the direction(s) from which light should reach a point of intersection. It should take in an `Intersection` as input, as well as the `Ray` that caused the `Intersection`. It will return a `Color3f` which is the multiplication of the light color and `Material` color.
- A `Color3f` member variable that represents the base color of the `Material`.

`Material` Subclasses (60 points)

Create the following classes which inherit from `Material` :

- `LambertMaterial`
- `BlinnPhongMaterial`
- `SpecularReflectionMaterial`
- `SpecularTransmissionMaterial`

As their names imply, these should represent some of the various surface reflection and transmission functions we discussed in class. Importantly, they will each implement `GetScatteredColor` differently:

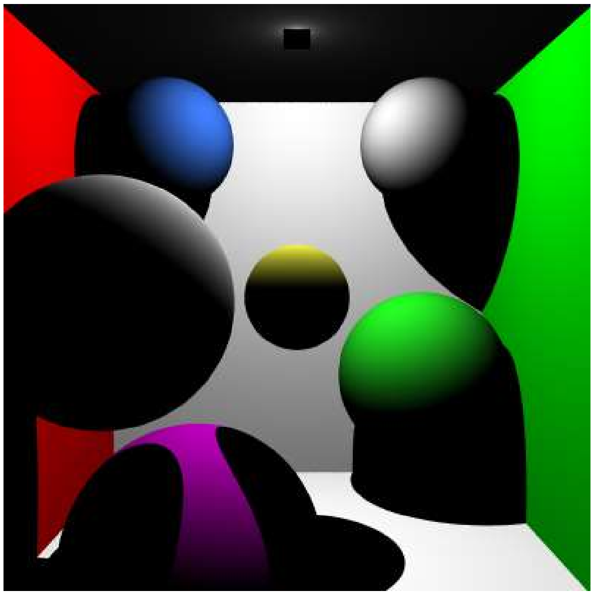
- `LambertMaterial` and `BlinnPhongMaterial` should sample all light sources in the scene for their color (testing for visibility) and return the sum of their colors multiplied with the `Material` base color.
- `SpecularReflectionMaterial` should reflect the input `Ray` about the surface normal and evaluate `GetScatteredColor` at the point where the reflected `Ray` intersects the scene.
- `SpecularTransmissionMaterial` should refract the input `Ray` through the surface about the surface normal and evaluate `GetScatteredColor` at the point where the transmitted ray intersects the scene. Make sure to offset the new `Ray` 's origin in the correct direction so the `Ray` doesn't infinitely intersect the object it's trying to pass through.

Putting it all together

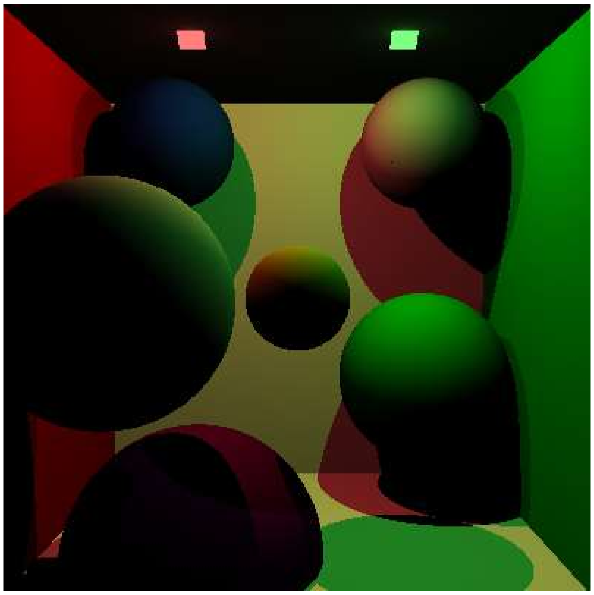
Once you have these classes, you can update your image generation function in `MainWindow` to trace each ray that is cast through the scene and evaluate the scattered light energy at each point of intersection.

We have provided a few JSON files in the Git repository for this assignment. You do **not** need to implement a scene loader, but you should create `Scene` layouts that match the ones provided in the JSONs so you can test your rendering engine against the provided example images. One important note: the provided scene files were designed for last year's iteration of the ray tracer, and do not explicitly define light sources, but assign emissive `Material` s to objects. Since we are treating `Light` s a little differently (and only using point lights this week), just note that the example renders will have visible light sources that your renders will not have.

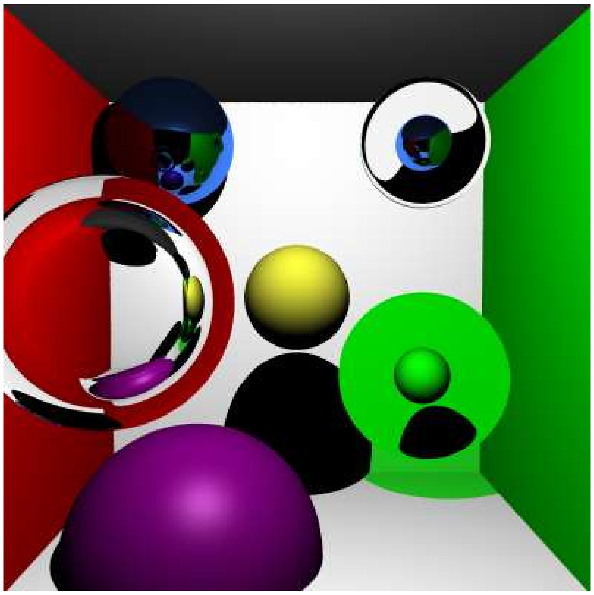
`cornell_box.json`



`cornell_box_2lights_simple.json`



`reflection_refraction.json`



Code Style (10 points)

For the ray tracer assignments in this course, we will be grading you on coding style since you'll be writing nearly all of the code yourself. We will be following the style guide defined in CIS 560; you can find it here if you need to review it. Part of this style guide is based on the design decisions made in `Physically Based Rendering`, so adhering to it now will help you to better understand PBRT's code once we begin the path tracer.

Submitting your project

Rather than uploading a zip file to Canvas, you will simply submit a link to the committed version of your code you wish us to grade. If you click on the **Commits** tab of your repository on Github, you will be brought to a list of commits you've made. Simply click on the one you wish for us to grade, then copy and paste the URL of the page into the Canvas submission form.

At the top of this Markdown file, add a section titled "[Your Full Name Here]'s Results" and show your test renders there.