Assignment 5: Ray

CS 175: Introduction to Computer Graphics – Fall 2025

Algorithm due: **Wednesday November 19** at 11:59am
Project due: **Thursday December 4** midnight at 11:59pm

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1 Instructions

Complete this assignment only with your teammate. When a numerical answer is required, provide a reduced fraction (i.e. 1/3) or at least three decimal places (i.e. 0.333). Show all work; write your answers on this sheet.

2 Rays

[**2 points**] The high-level view of our ray tracer is exactly the same as for `Intersect`, except for a few additions. Below is the pseudocode for `Intersect`. What needs to be changed/added to make this a full-fledged recursive raytracer? Explain in English.

> **for** *pixel* ∈ *Canvas* **do**
>   Cast a ray to find the nearest object
>   **if** ray intersects an object **then**
>   **for** each light **do**
>   Cast a ray to the light and evaluate the lighting equation
>   *pixel* = *pixel* + *color* with diffuse, ambient, specular components
>   **end for**
>   **else**
>   *pixel* = background color
>   **end if**
> **end for**

- We need to calculate the direction of the reflected ray, and once we have that, cast a new ray in that direction coming off of the reflective surface.

- Set a hard limit for ray depth. If ray extends past maximum, render background/ambient for that pixel instead.

[**1 point**] Is recursive ray tracing a local or global illumination algorithm? Why?

Recursive ray tracing is a global illumination algorithm, since we are casting rays and simulating how light bounces off of the surface of each object in the scene. This means that objects can interact with each other in the scene because light reflecting off of one object might hit and indirectly illuminate another object.

[**1 point**] For a particular ray that intersects with an object, when do you not consider contribution from a given light source? How do you computationally determine when this scenario occurs?

We do not consider the contributions from a light source when the intersection point is in shadow relative to that light, that is, any object occludes the hit point from the light source.

3   How to Submit

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