

# Math/CS Capstone: Advanced Graphics

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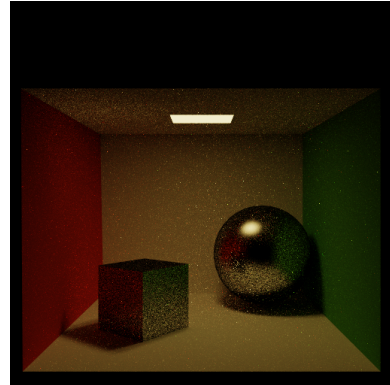
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## 1 Introduction

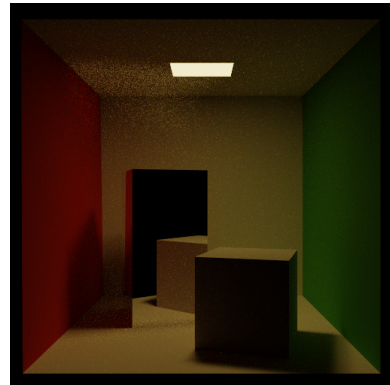
For my Sc.B. Math/CS capstone, I capstone-d CSCI2240 Advanced Graphics. In this course, we implemented a series of graphics research papers with some additional features to each.

## 2 Path Tracer

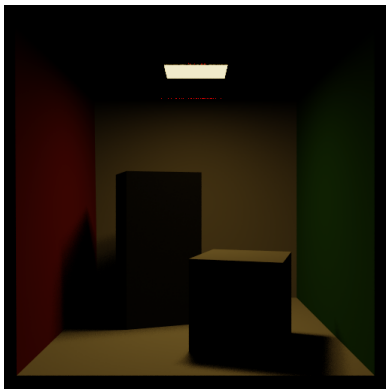
In this project, we implemented a physically-based, un-biased path tracer.



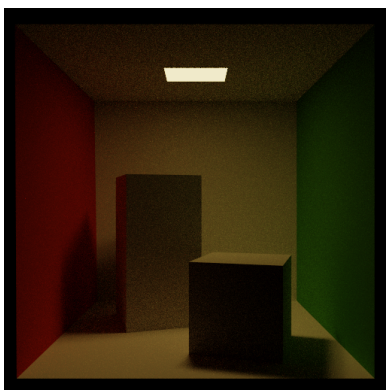
Caption: Glossy



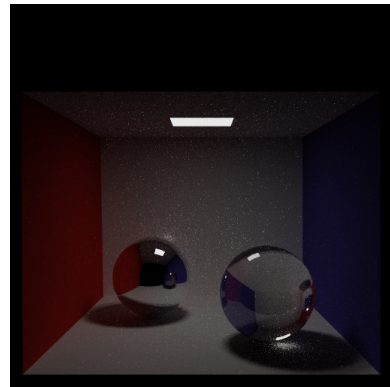
Caption: Mirror



Caption: Direct lighting only



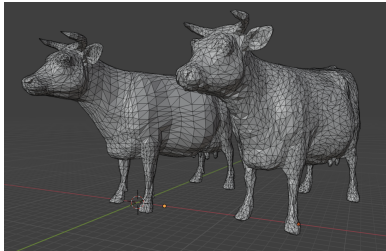
Caption: Full lighting



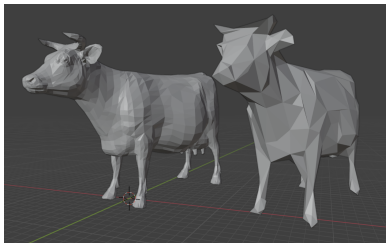
Caption: Refraction

### 3 Mesh

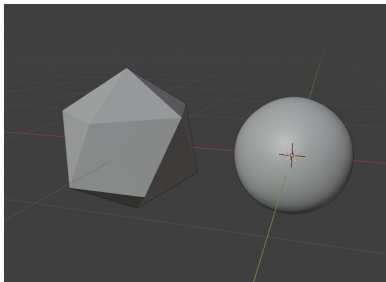
In this project, we implemented functions to subdivide, simplify, and re-mesh input meshes.



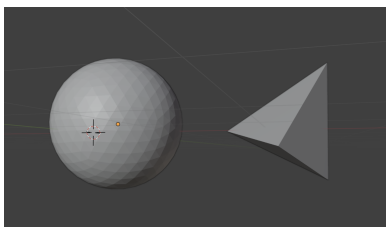
Caption: Subdivide cow



Caption: Simplify cow



Caption: Subdivide icosahedron



Caption: Simplify icosahedron

### 4 FEM

In this project, we implemented a soft body simulation using a sparse finite element method solver. Results for this project, including videos will be linked in the following google drive folder.

### 5 ARAP

In this project, we implemented the paper As Rigid as Possible Surface Modelling, which outlines a method for deforming a mesh but keeping it identifiable. Results can be found in the same folder as in the previous project.

### 6 Plant Transport

For our final project in the course, we implemented this paper on a physically inspired approach to simulation plant wilting, which required three steps,

1. simulate water transport in plants by creating a physically based model,
2. convert water content from the simulation into elasticities,
3. use elasticities in conjunction with the plant model in a physics simulation to create the plant wilting effect.

The final animation can be seen in the video files at the following link 1, link 2. The following images are either progress images or images taken from the final animation.



Caption: Frame 1



Caption: Frame 141



Caption: Frame 249