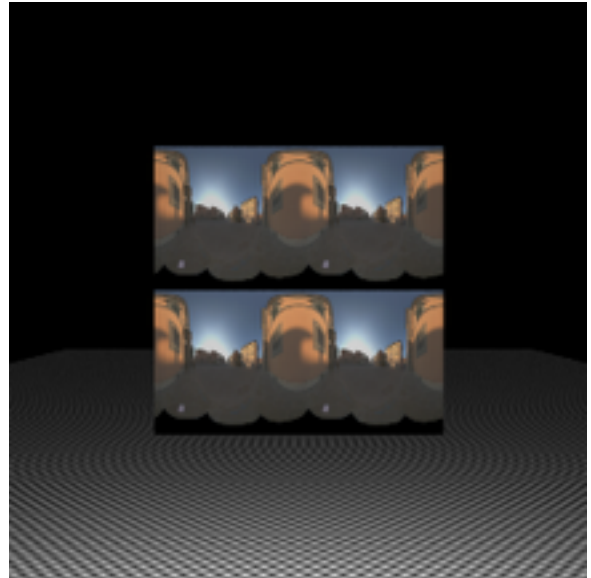
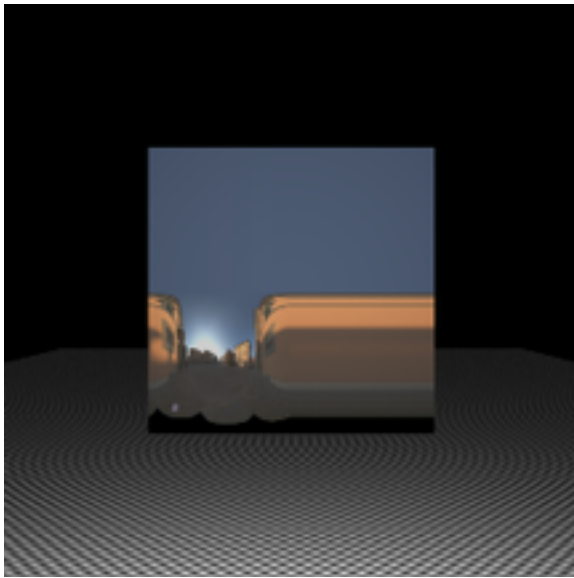


CS 77 Final Report

The following methods were implemented in the path tracing final assignment:

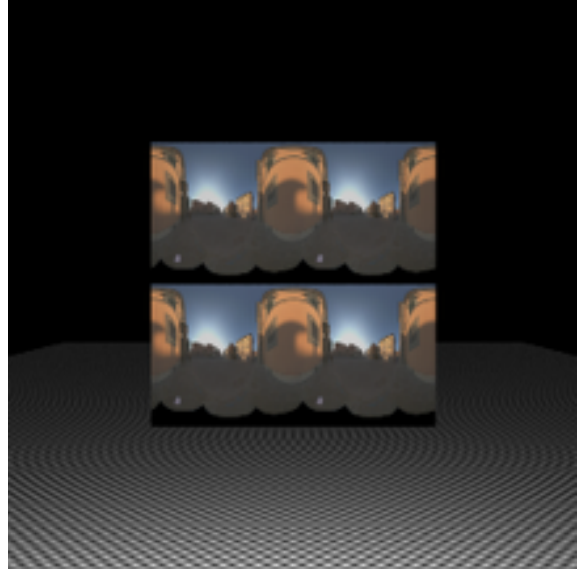
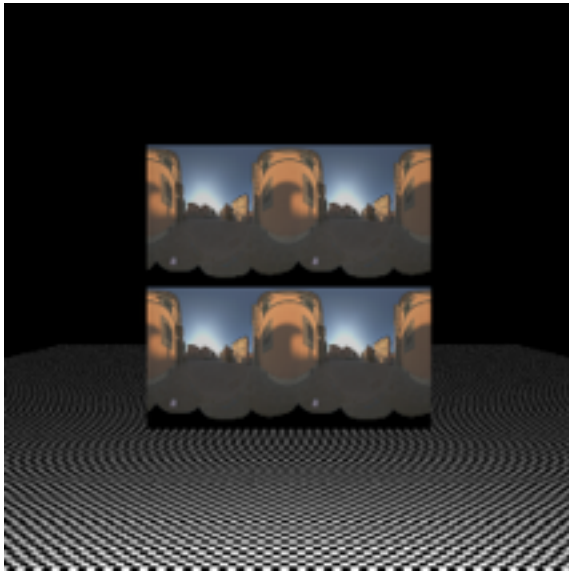
1. Texture Tiling
2. Texture Filtering
3. Quad Area lights
4. Sphere lights
5. Environment Illumination
6. Microfacet Materials
7. Indirect Illumination

I. Texture Tiling - The contrast below shows the effects of texture tiling:



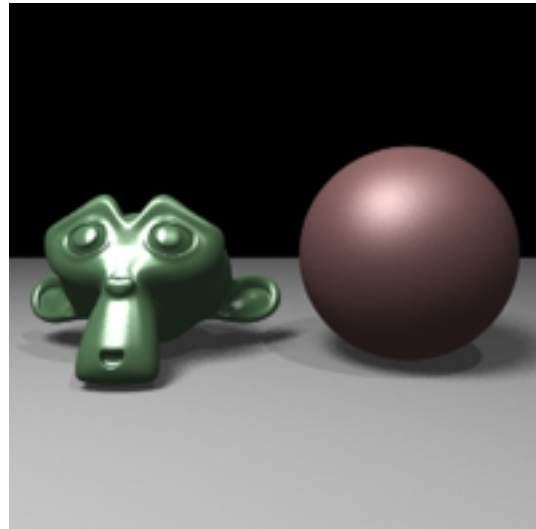
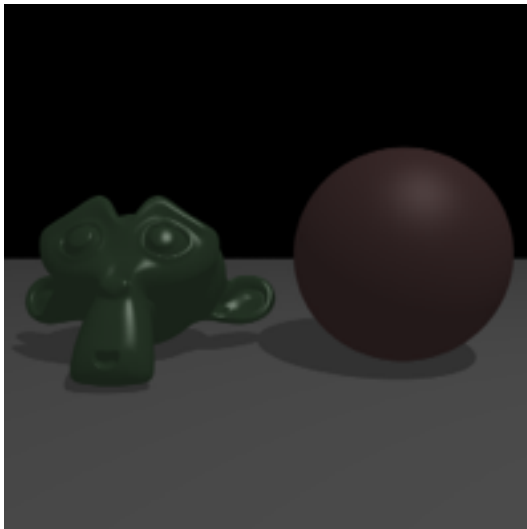
The image on the left is generated using clamping whereas the image on the right is generated using tiling. See `o8_textured_tiling.json` for implementation details. Both images took less than 5 seconds to render with 2 image samples.

II. Texture Filtering - Although small, the contrast below shows the effect of bilinear texture filtering:



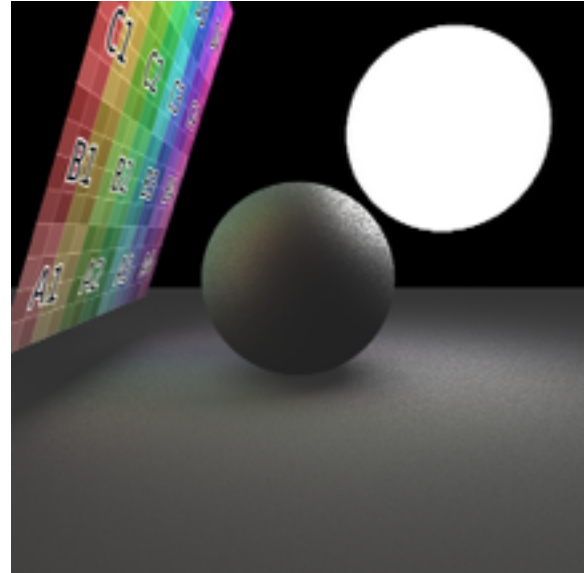
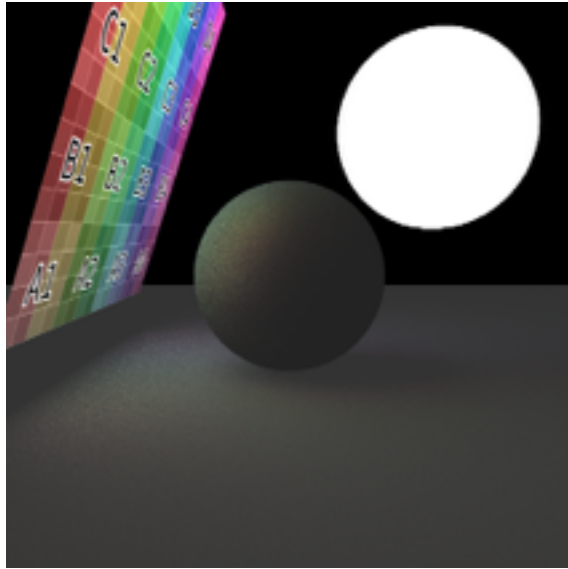
The distinction is easiest to see in the soft tiles of the floor in the image. Again see `o8_textured_tiling.json` for implementation details. Again both images took less than 5 seconds to render with 2 image samples.

III. Quad Area lights - The following shows the effect of implementing the quad area lights feature:



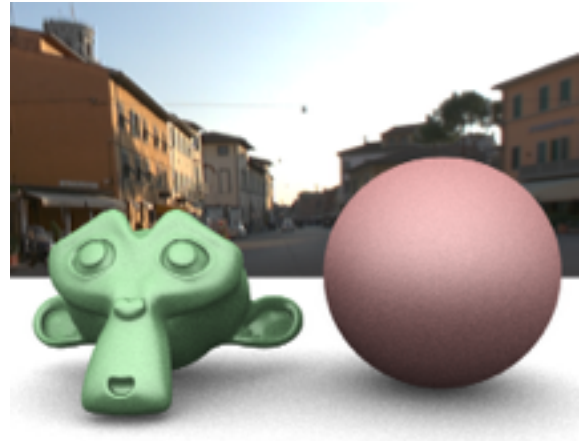
The image on the left uses only a point light off to the right of the screen, but the image on the right has a quadratic light behind the viewing frame that illuminates the figures in the foreground. See o2_area.json for implementation details. The images took 55 seconds to render with 15 image samples.

IV. Sphere area lights - the following shows the effect of implementing sphere lights and quad lights.



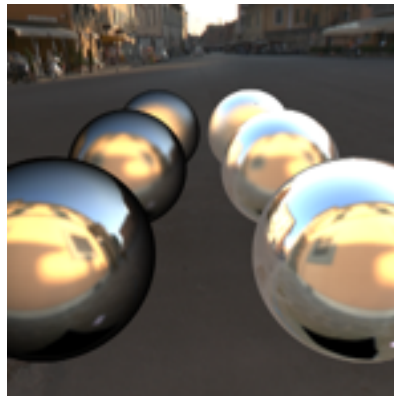
The image on the left makes use of one quad light and has a sphere, not implemented as a light. The image on the right exemplifies the implementation of the spherical light. See o4_lights.json for implementation details. The images took 61 and 65 seconds to render, respectively, with 20 image samples each.

V. Environment Lighting - the following are images rendered without and with the effect of environment lighting.



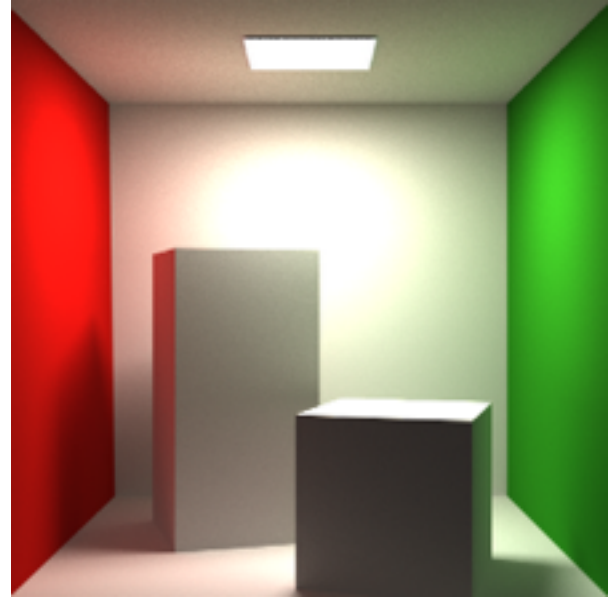
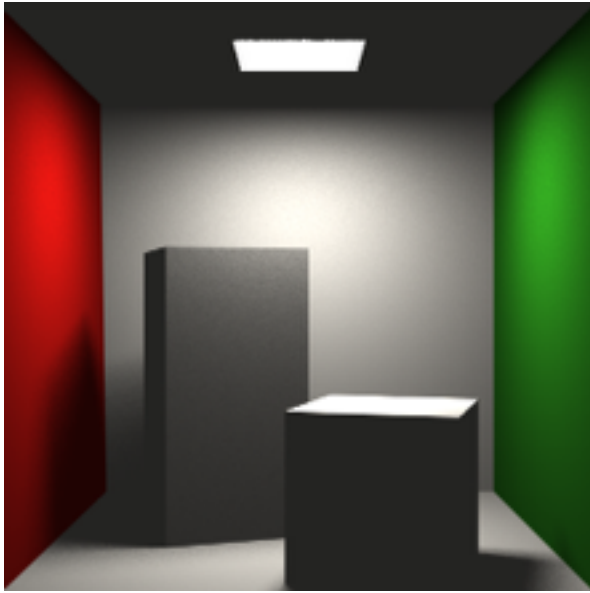
The first took 43 seconds and the second took 56 seconds to render with sample size of 18.

VI. Microfacet materials - the following images shows the difference between micro faceted (left) and non-microfaceted(right) materials.



The image took roughly 52 seconds to render with 15 image samples. See o5_materials.json for implementation details.

VII. Indirect Illumination - the following shows the effect of adding indirect illumination(right) to the Cornell Box scene shown with only direct illumination on the left.



The image on the left was rendered with lower spatial quality and took 230 seconds to render. The image on the right was rendered with higher quality and took roughly 503 seconds to render, each with 32 image samples. See `o6_direct_cb.json` and `o7_indirect_cb.json` for implementation details. The larger version of the second image is located in the submission folder and was rendered with 32 image samples took 20 minutes to render.