

Assignment 1

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1 Tasks

Implemented:

- Completing Wienori's MC Intestines (1 Point)
- Ambient occlusion (2 Points)
- Direct lighting, Hemisphere sampling (4 Points)
- Path tracing (11 points)
 - Start (4 points)
 - BRDF/BSDF (2 points)
 - Russian Roulette (1 point): I implemented the version with the fixed continuation probability
 - In a loop (4 points): both recursive and iterative versions of the path tracer are in the same file: `path_tracer_recursive.cpp`, in functions `Li_recursive` and `Li_iterative`. The choice can be specified in the scene file.
- Motion blur (9 points)
- Depth of Field (6 points)
- Standard Deviation (3 points)

2 Bonus Tasks

2.1 Motion Blur

I implemented motion blur via jittering the camera. In particular, the user can specify a `vector` named `motionBlurVelocity` for the velocity of the camera in the `.xml` scene file. According to this velocity, the camera is moved a little bit for a uniformly random time before sampling each ray. This movement is implemented in a function `animate(time)` in the `Perspective` class. The results can be seen in Fig. 1. Corresponding scene files are available in `/scenes/assignment1/`.

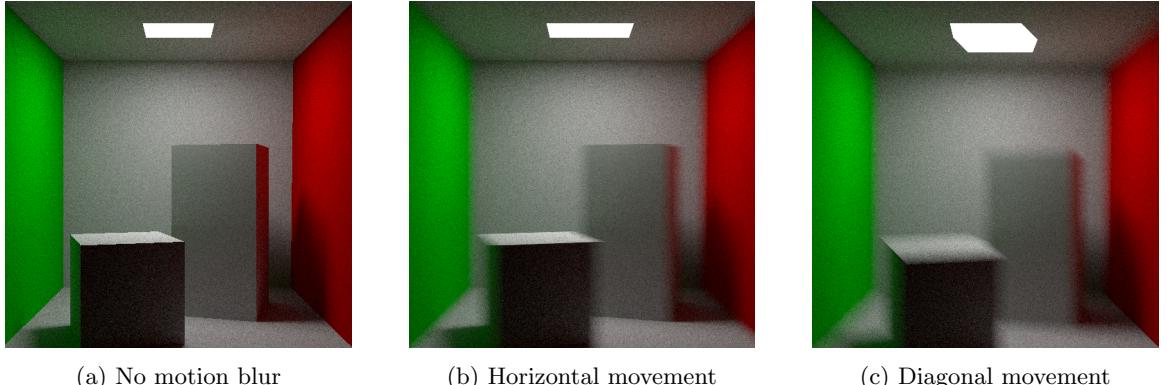


Figure 1: Motion blur effect on the whole scene by moving the camera. Scenes are path traced with sample counts set to 4096 for all three cases.

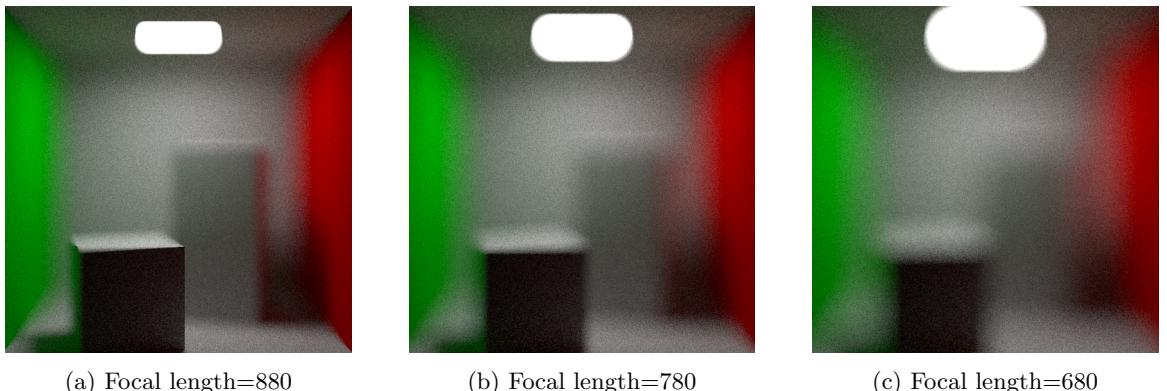


Figure 2: Decreasing the focal length pushes everything to the background. Aperture is set to 100 in all.

2.2 Depth of Field

Implemented depth of field. For each ray, I first computed the intersection with the focal plane, noticing that the ray that goes through exactly the middle of the lens does not refract. Then, a random point on the lens is sampled and the new ray connects this sample point to the intersection point on the focal plane. Fig. 2 compares the effect of focal plane. There are two parameters: focal length and aperture. Fig. 3 compares the effect of aperture.

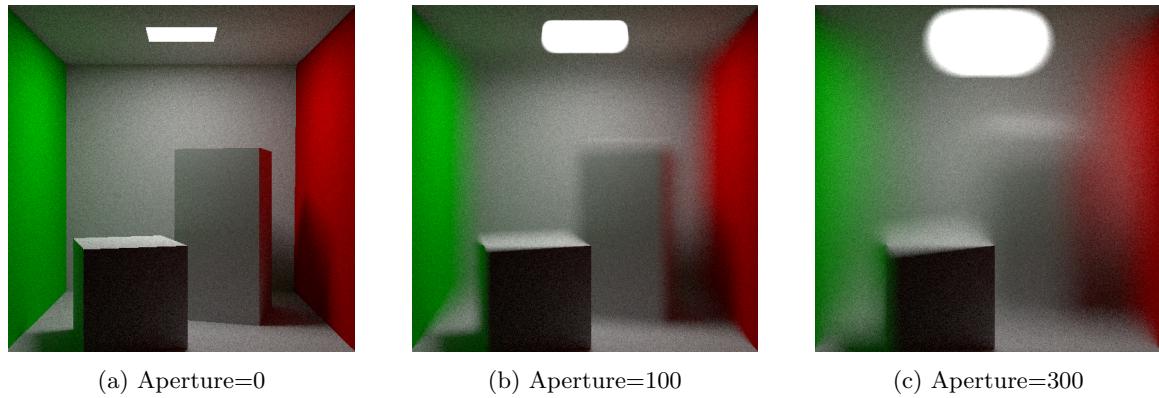


Figure 3: Increasing the aperture leads to a very narrow depth of field. If aperture is set to 0, then there is practically no depth of field. Focal length is set to 880 in all three. Note how in the figure on the right, part of the front cube is still completely in focus; that is where the focal plane passes.