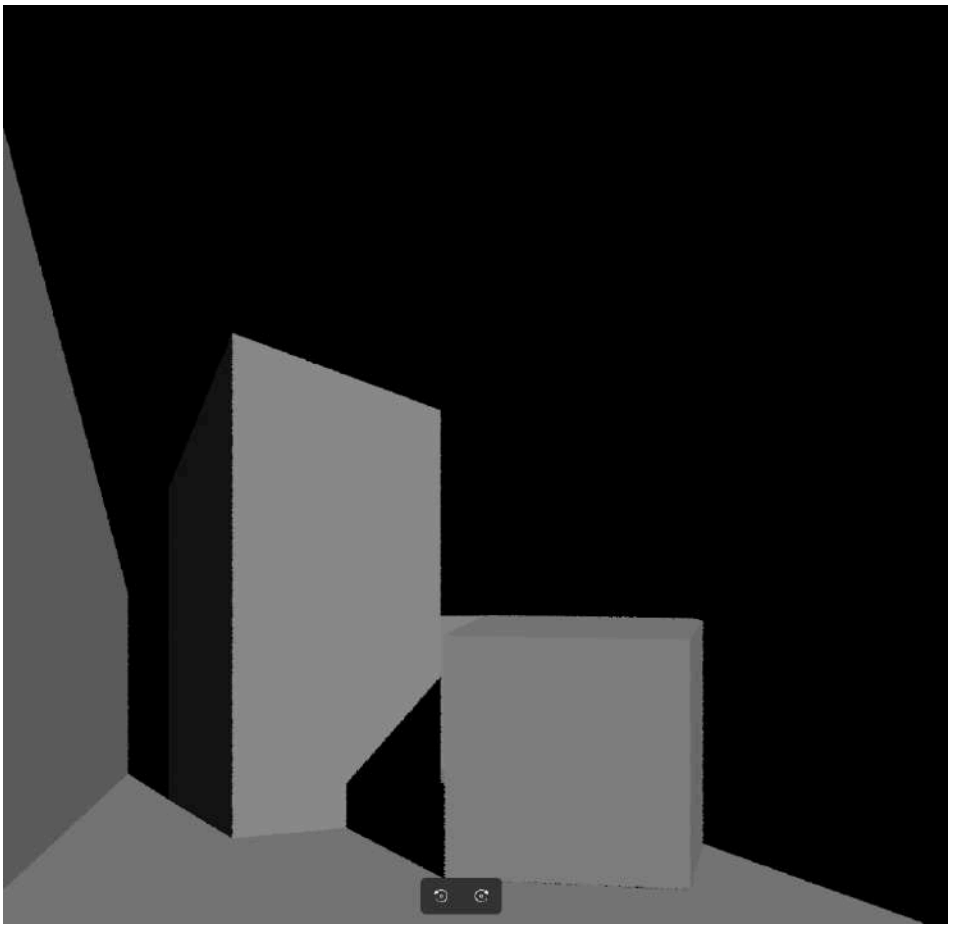
CG - Assignment 3 Report
Bhavani Chalasani - 2022101014

Q1:

1 px
Render Time: 1284.071045 ms



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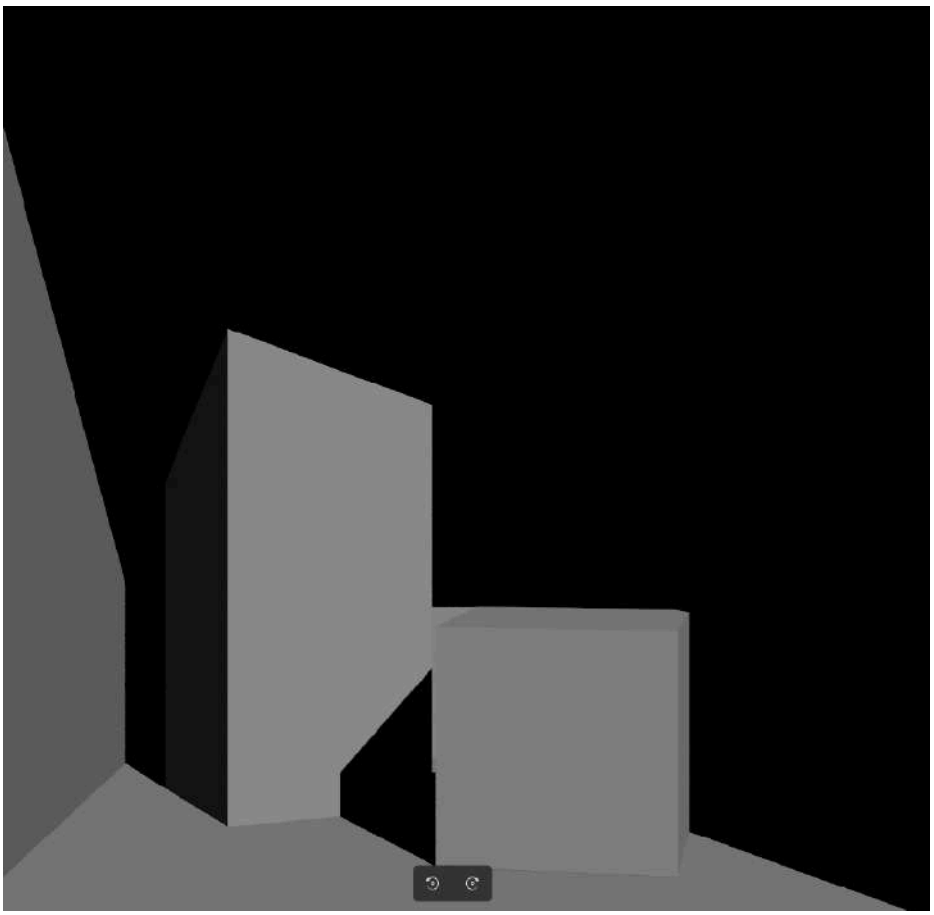

Q2:

Scene1.json:

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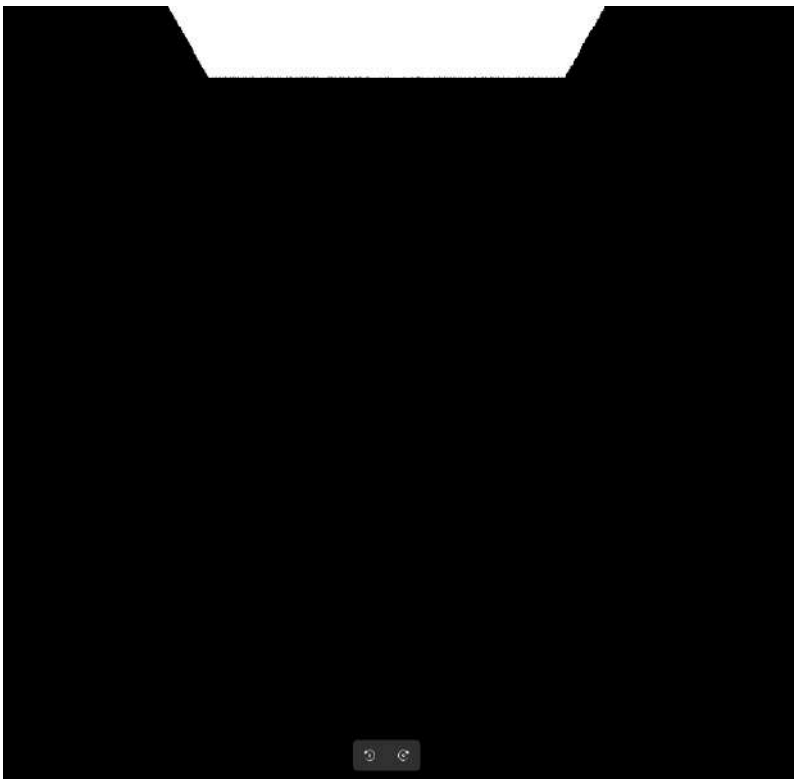

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Scene2.json:

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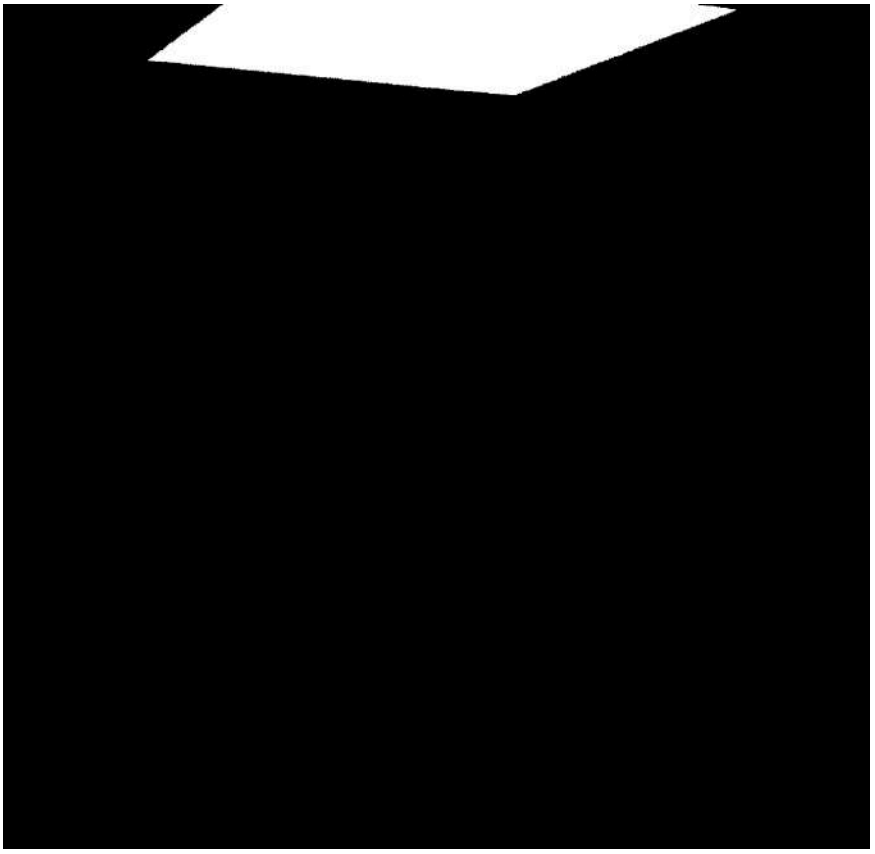

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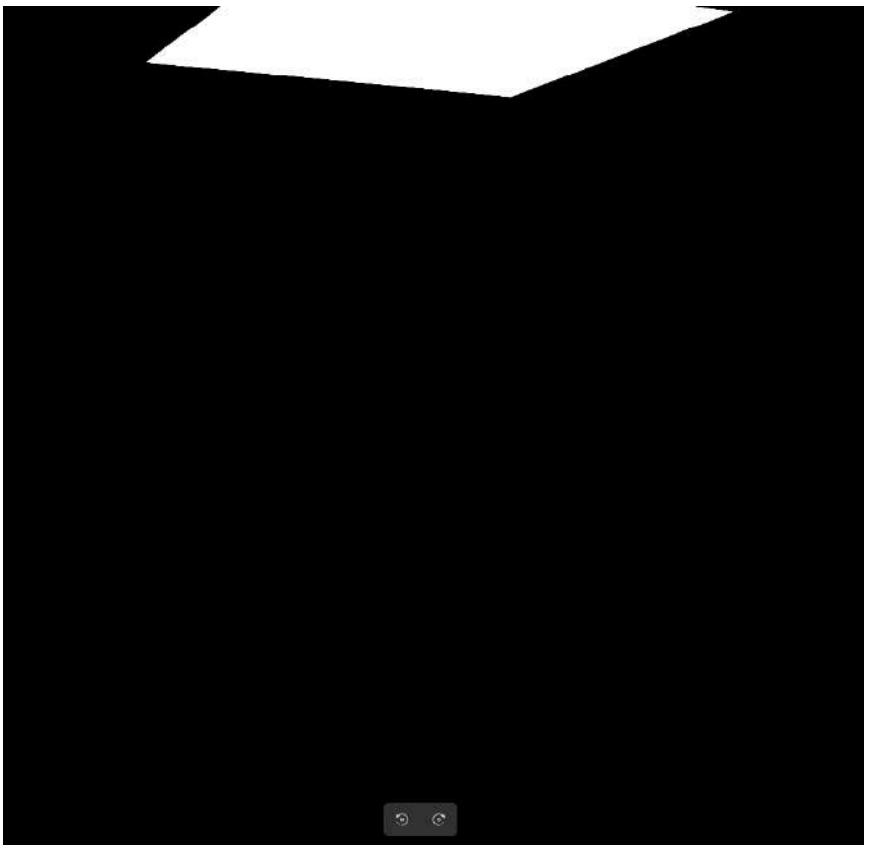

Scene3.json:

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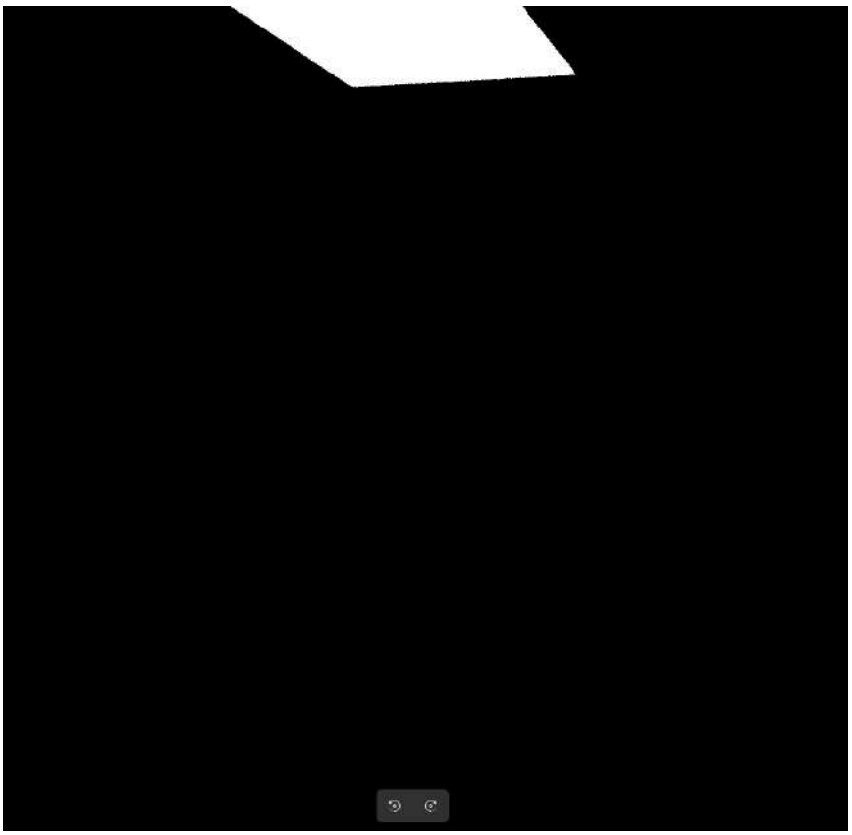

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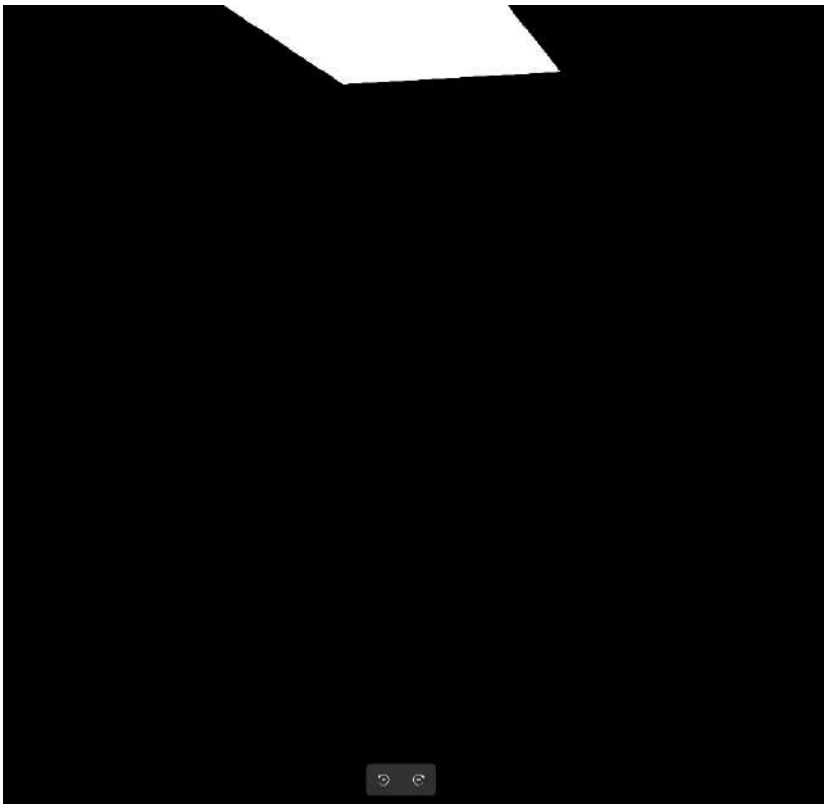

Scene4.json:

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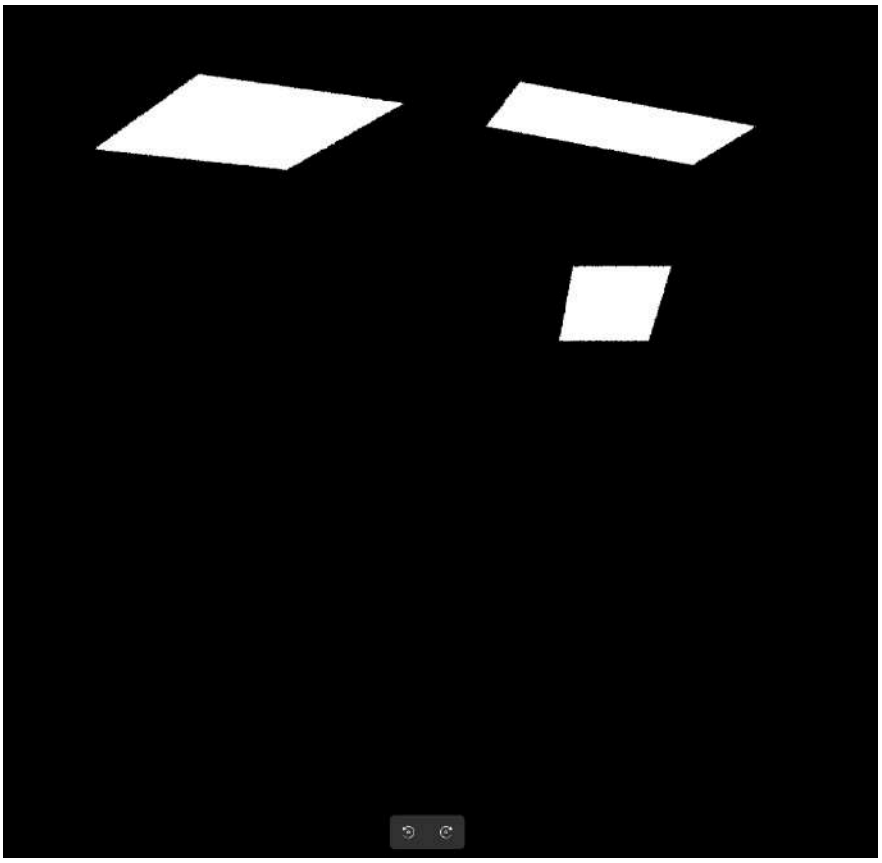

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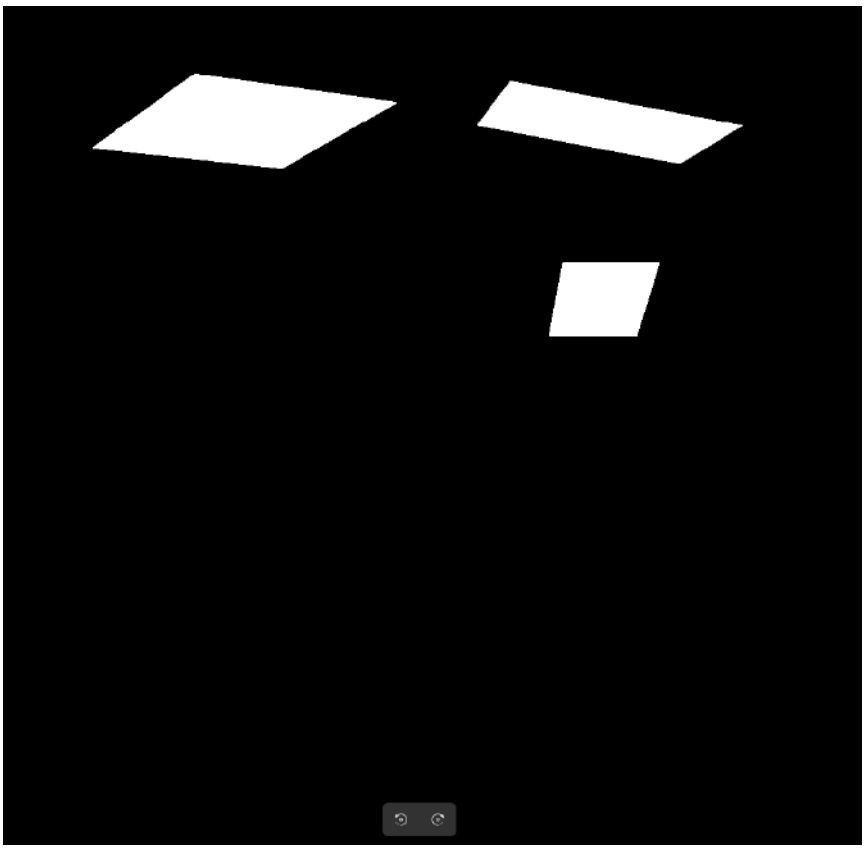

Q3

Uniform Hemisphere Sampling

Small.json:

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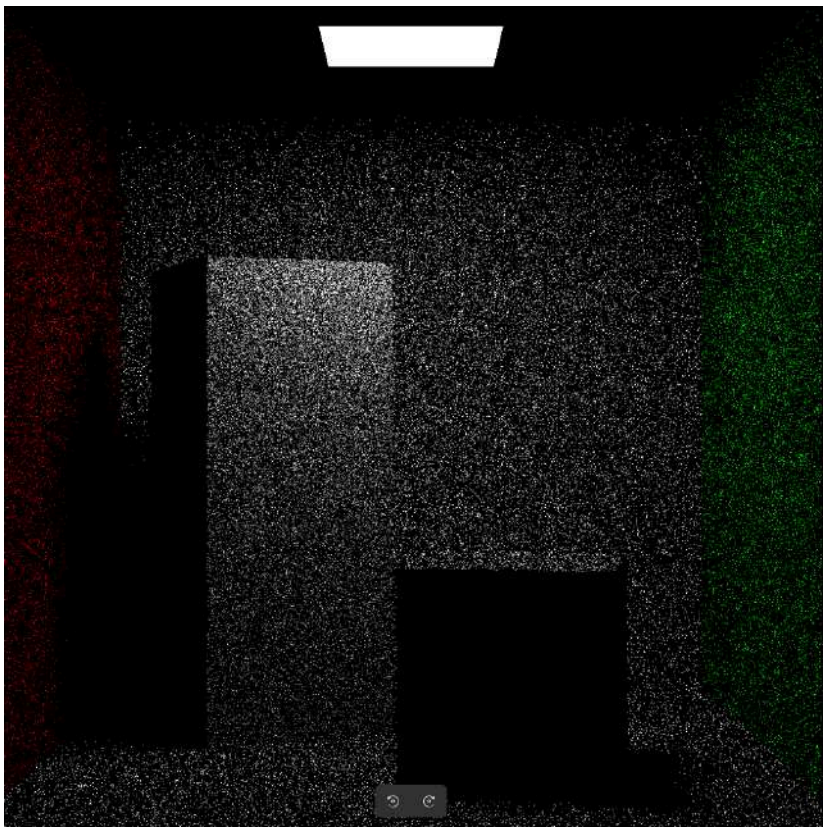
Render Time: 12053.296875 ms



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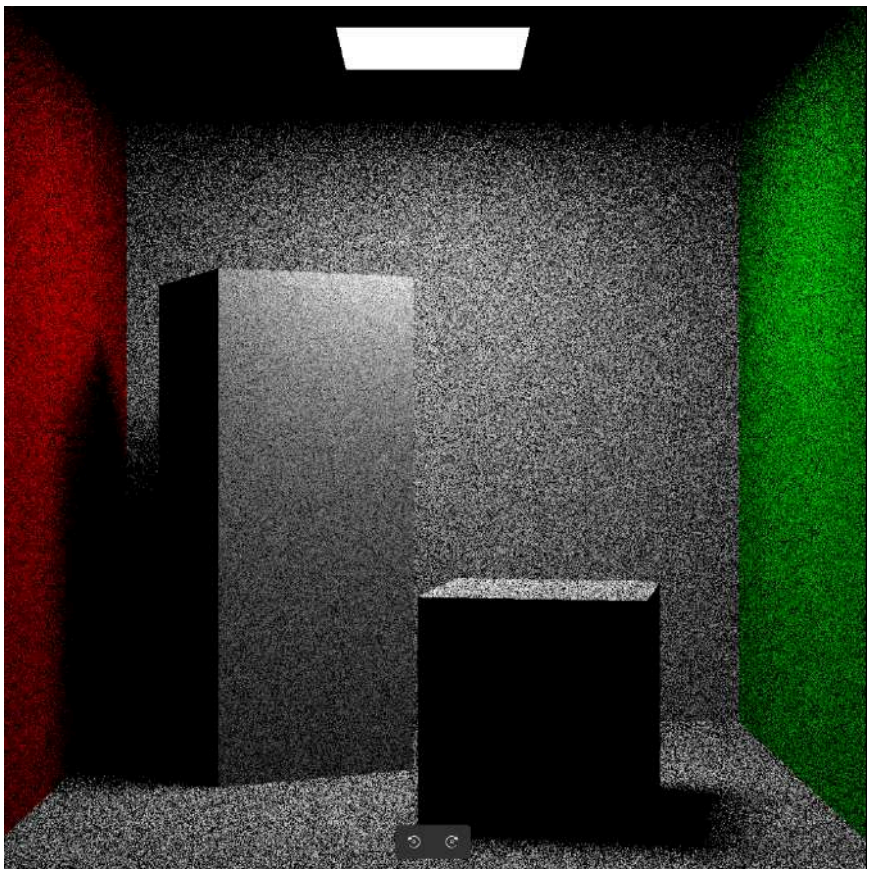

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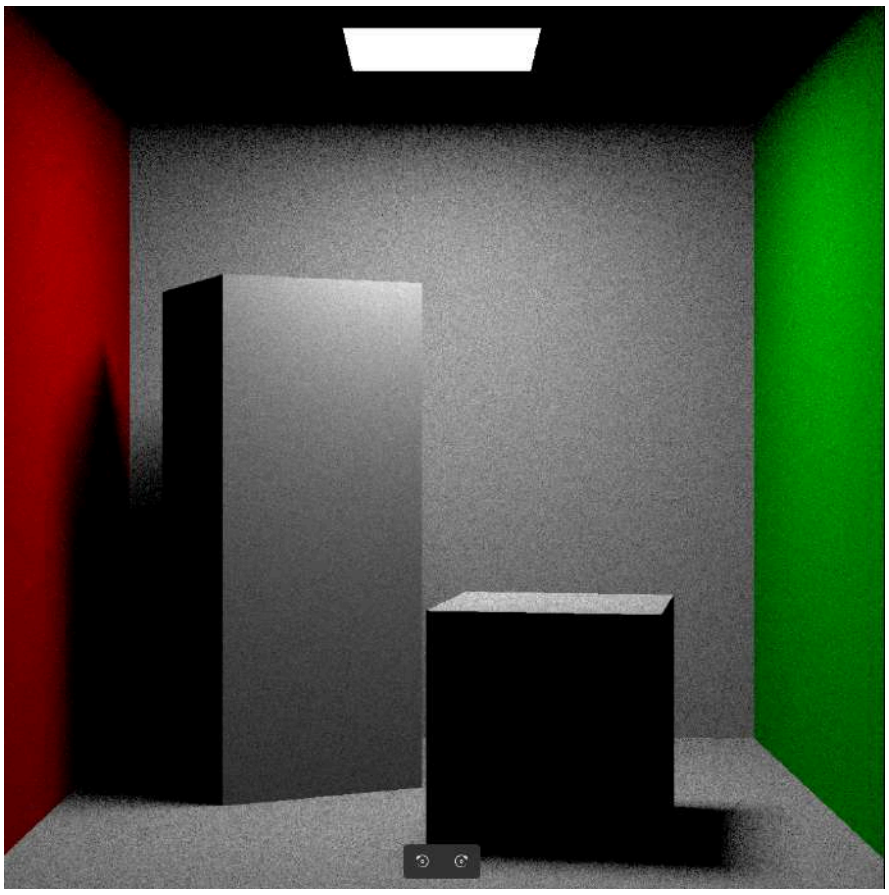

Med.json:

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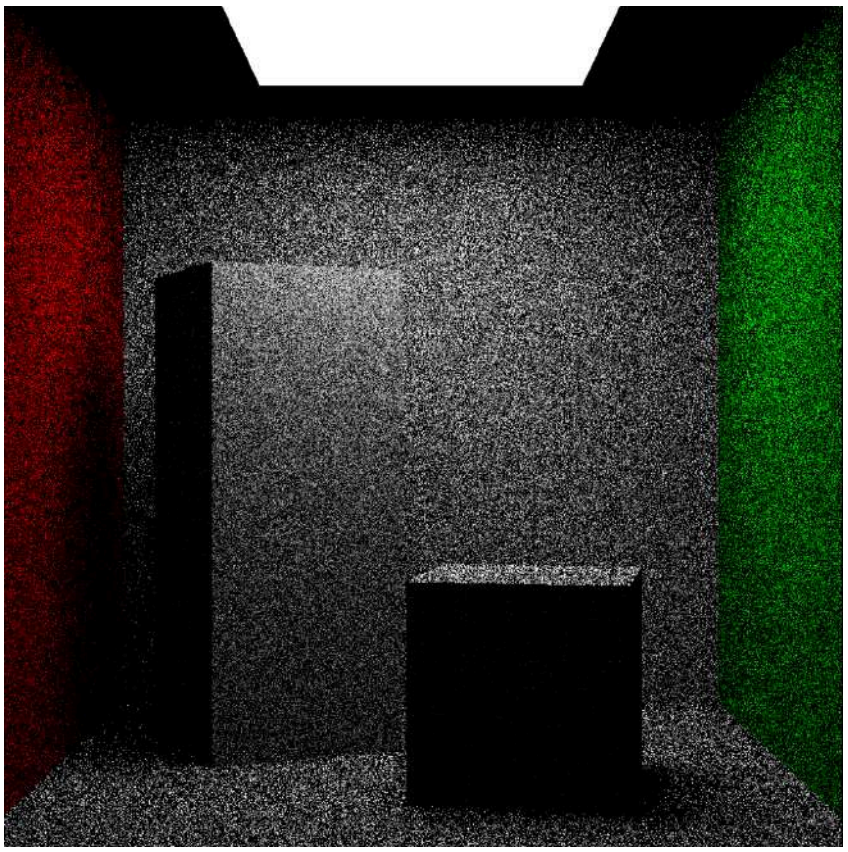

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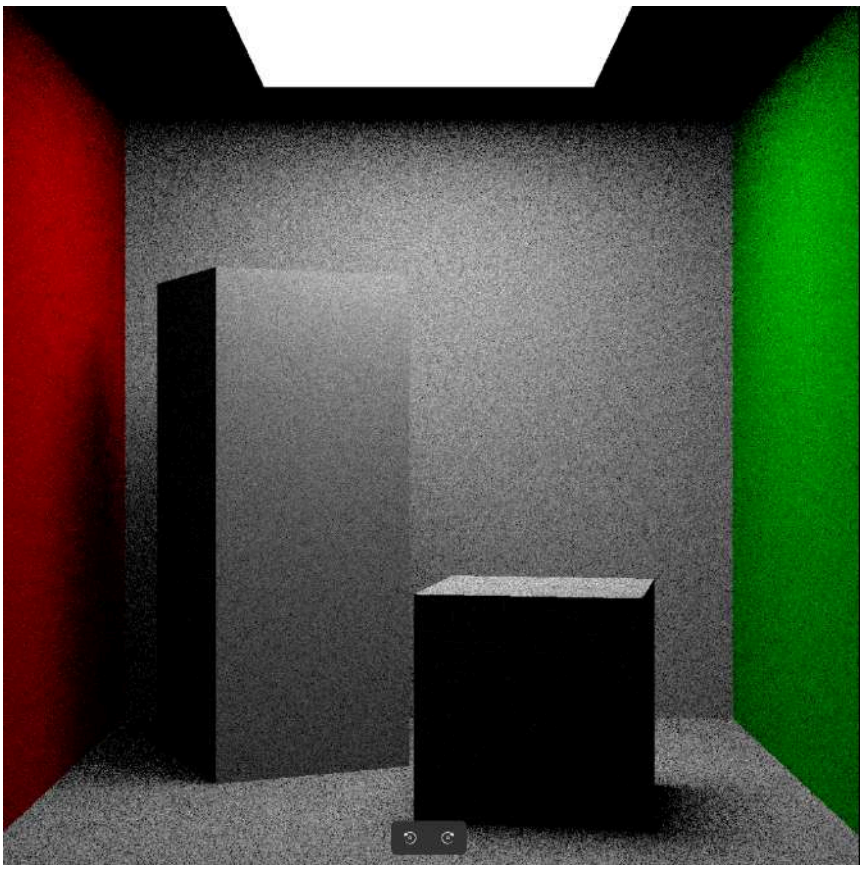

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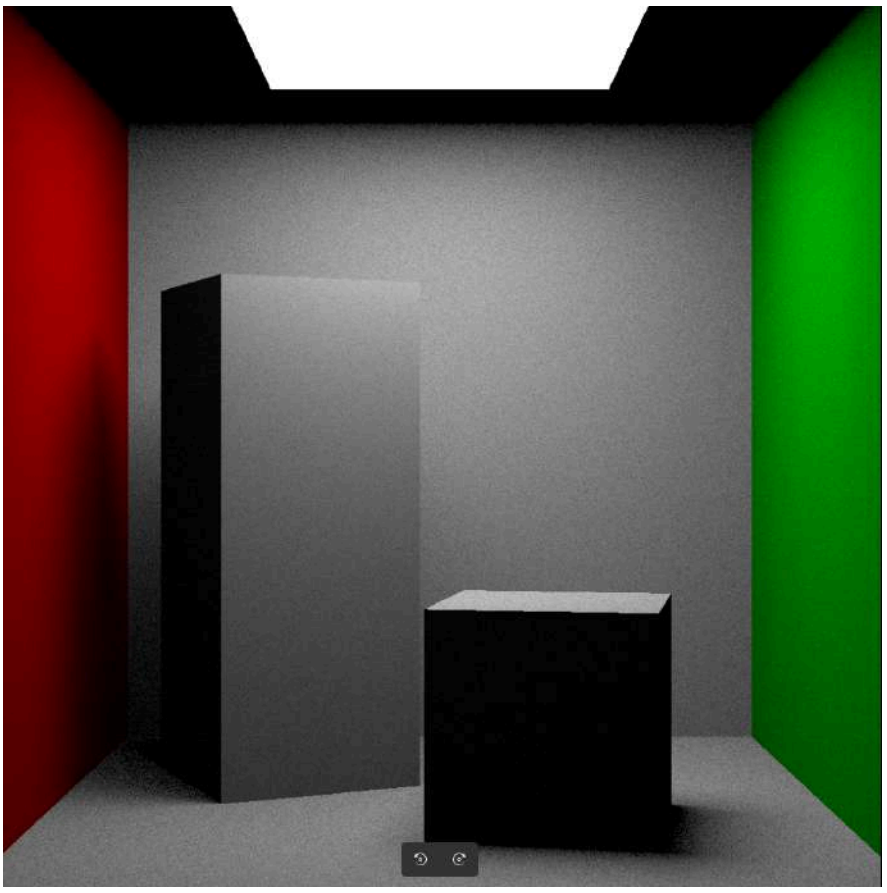

Big.json:

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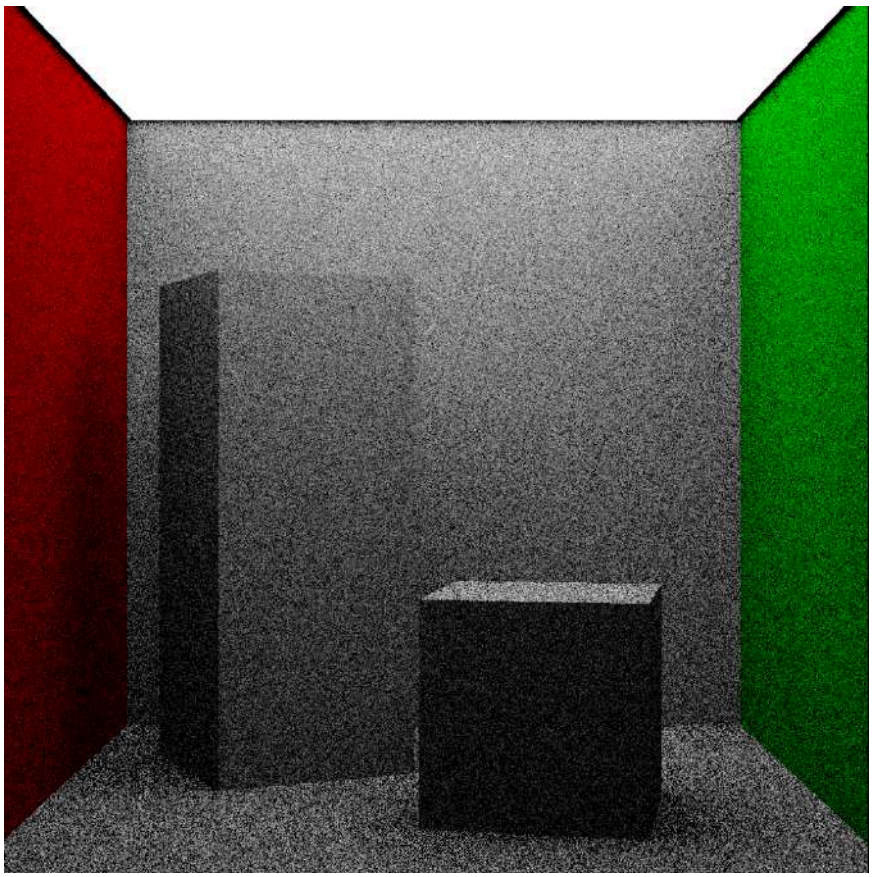
Render Time: 11567.656250 ms



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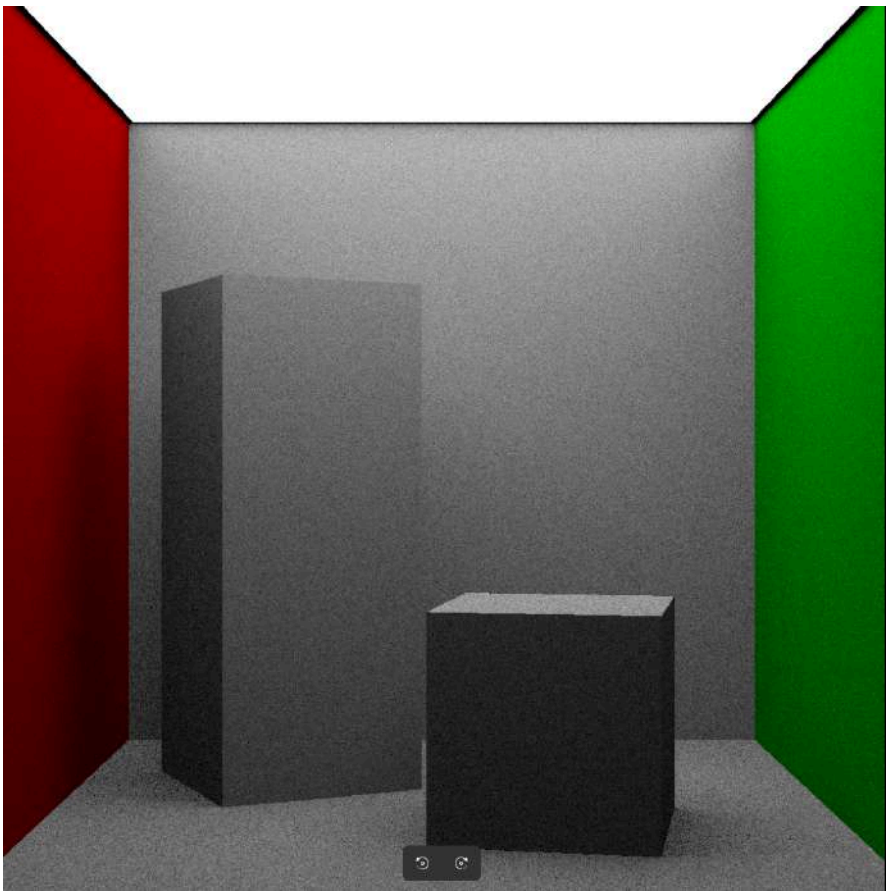

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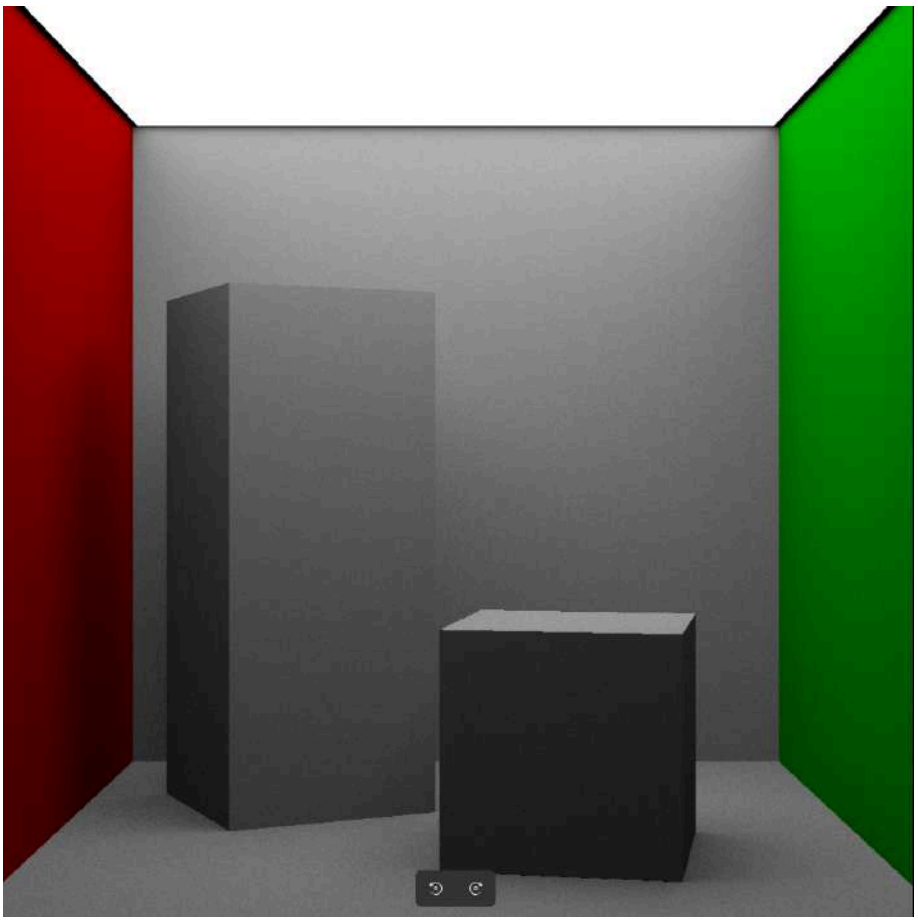

Many.json:

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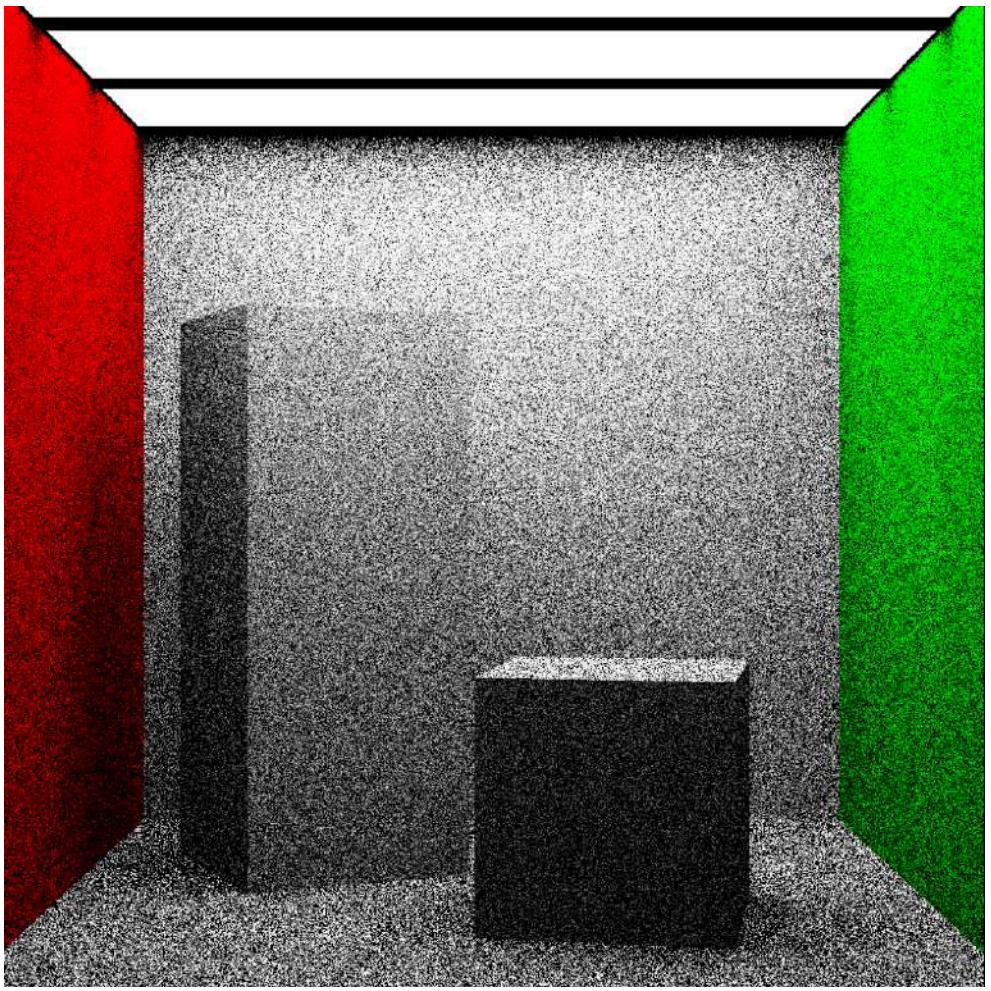
Render Time: 12322.791016 ms



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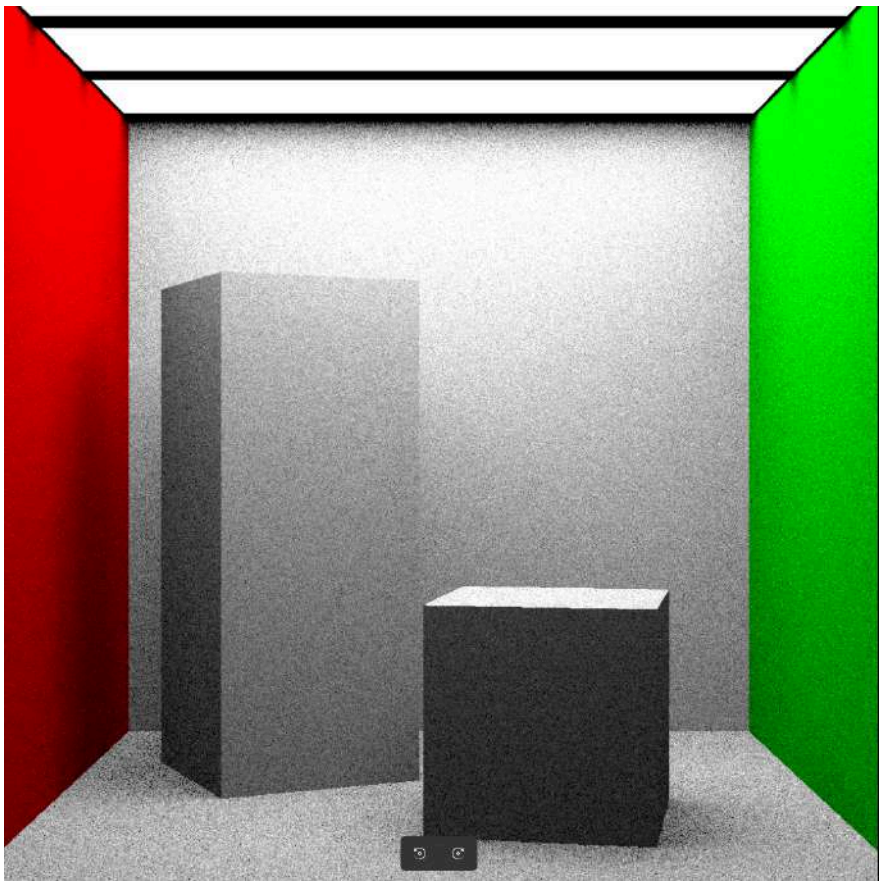

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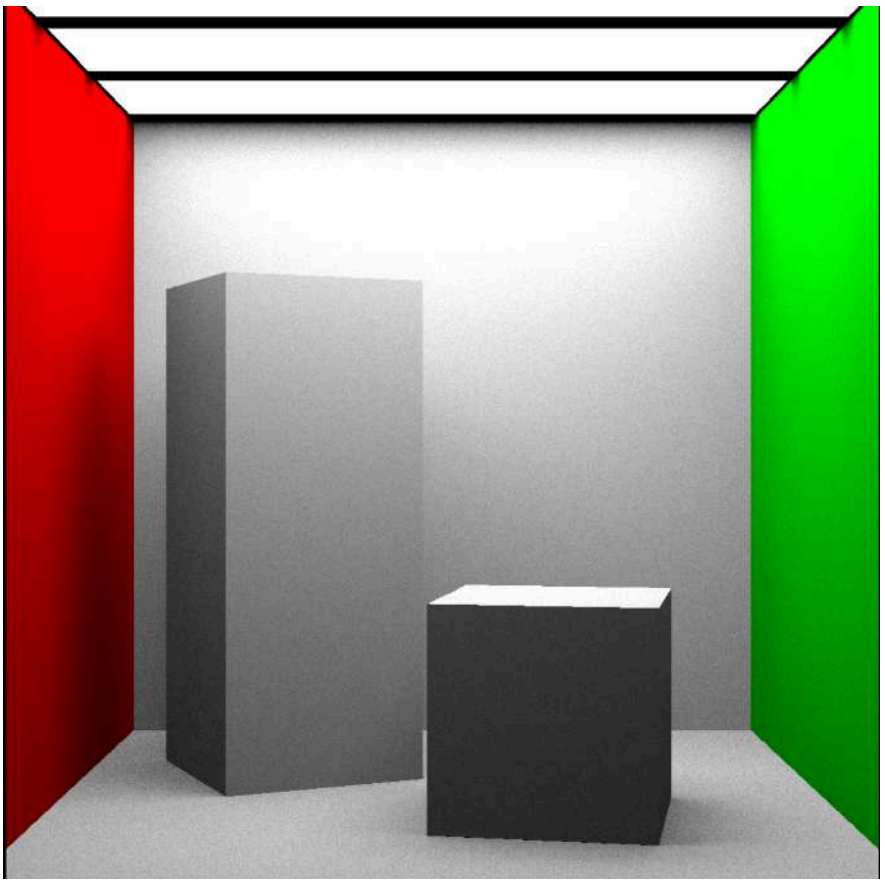

Cosine Weighted Sampling

Small.json:

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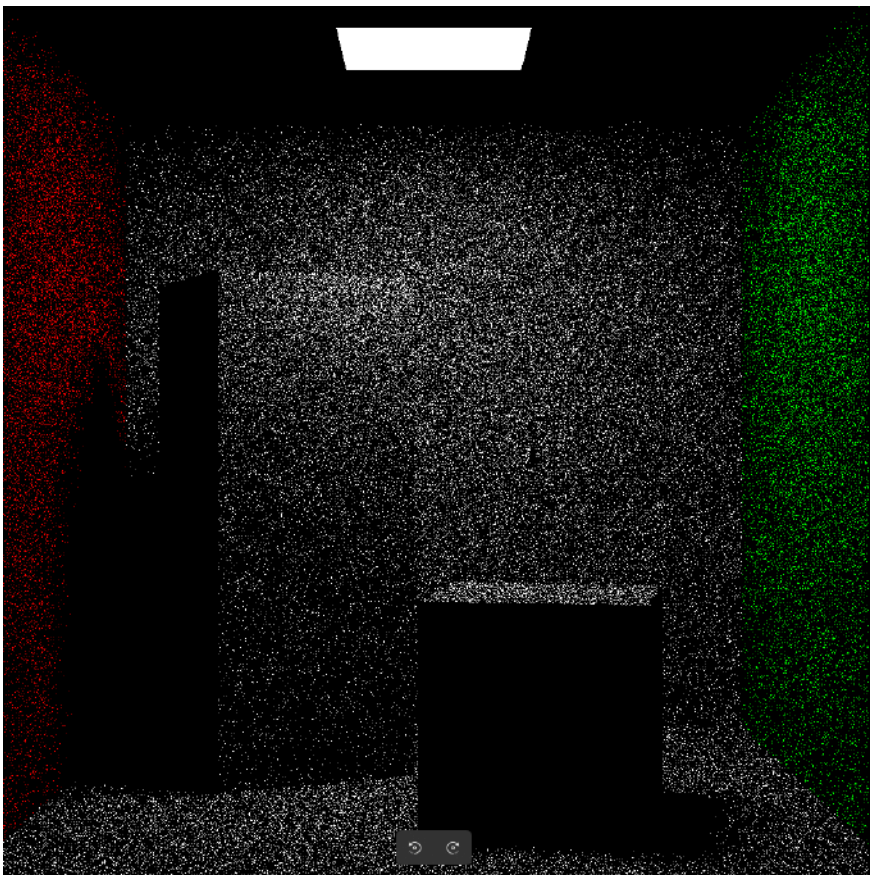
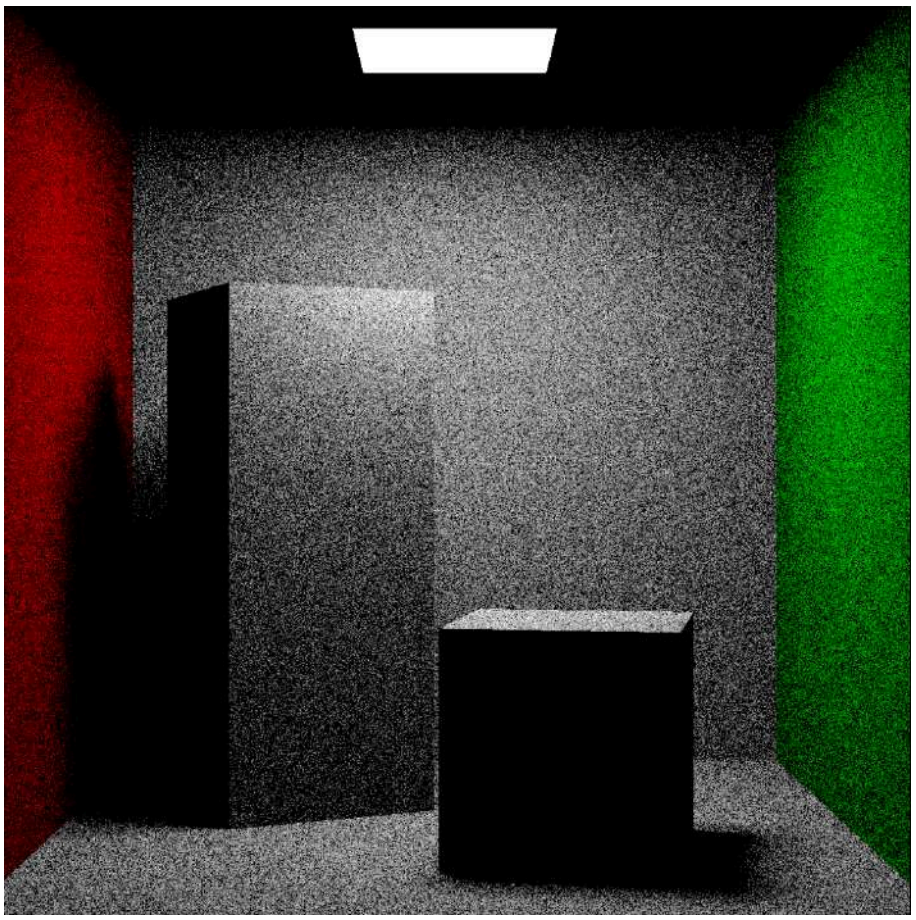
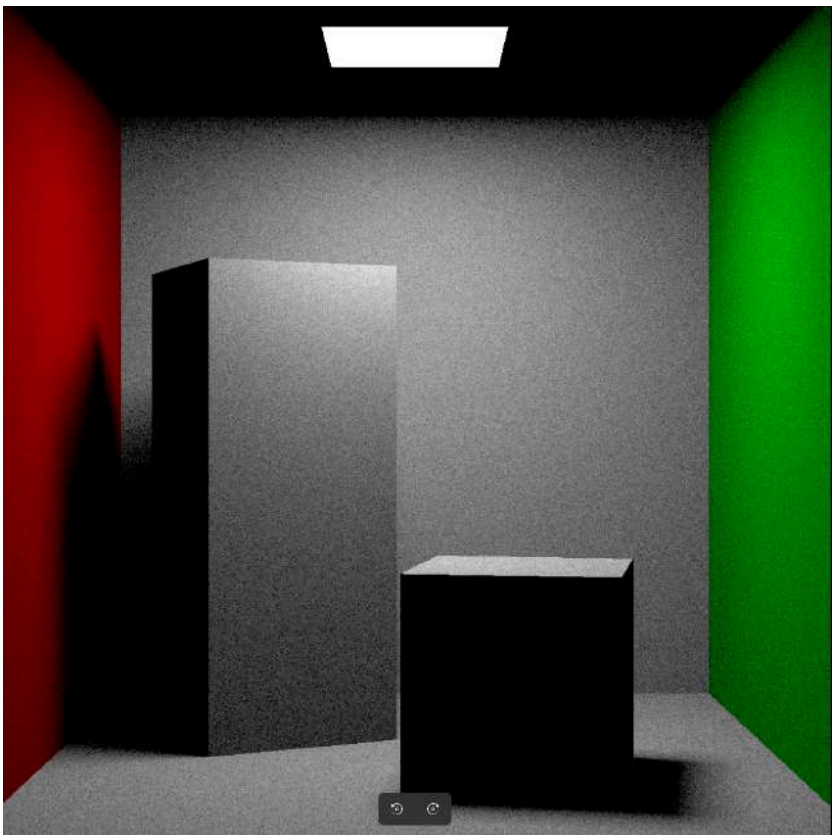


100 px
Render Time: 187714.921875 ms



1000 px
Render Time: 1354234.875000 ms



Med.json:

10 px
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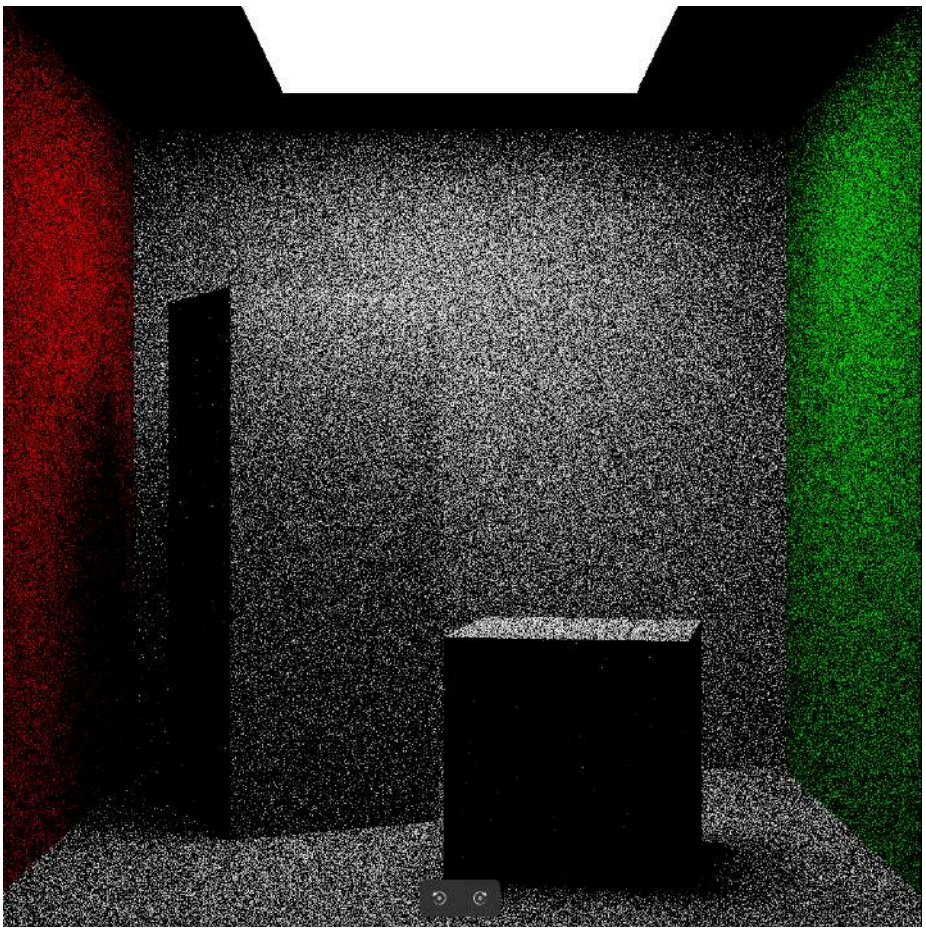

100 px
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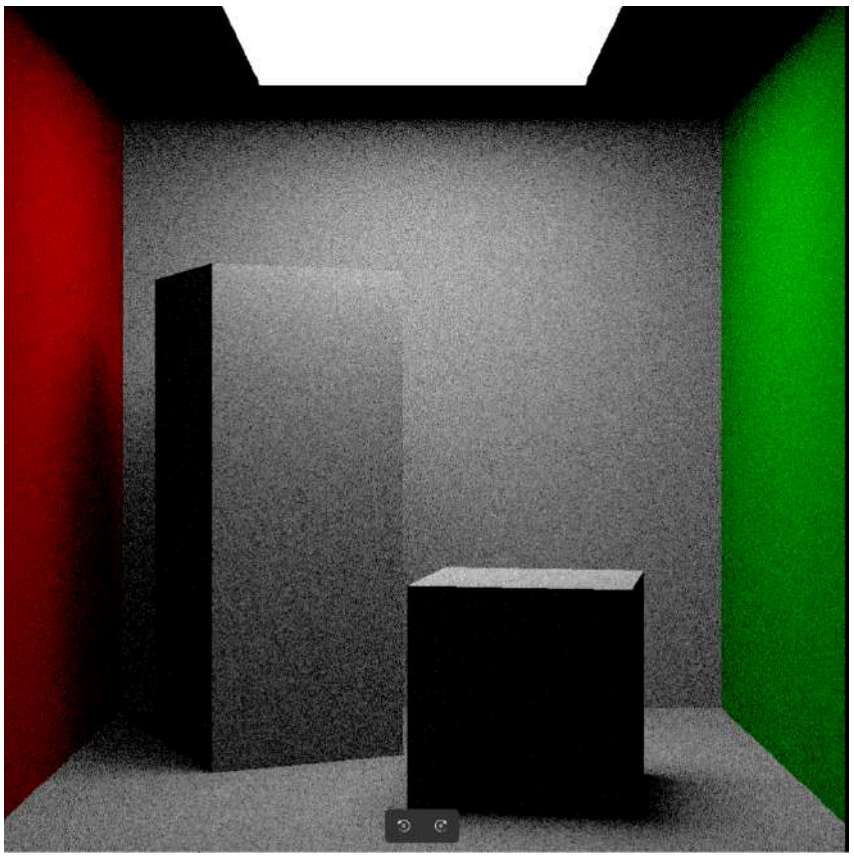

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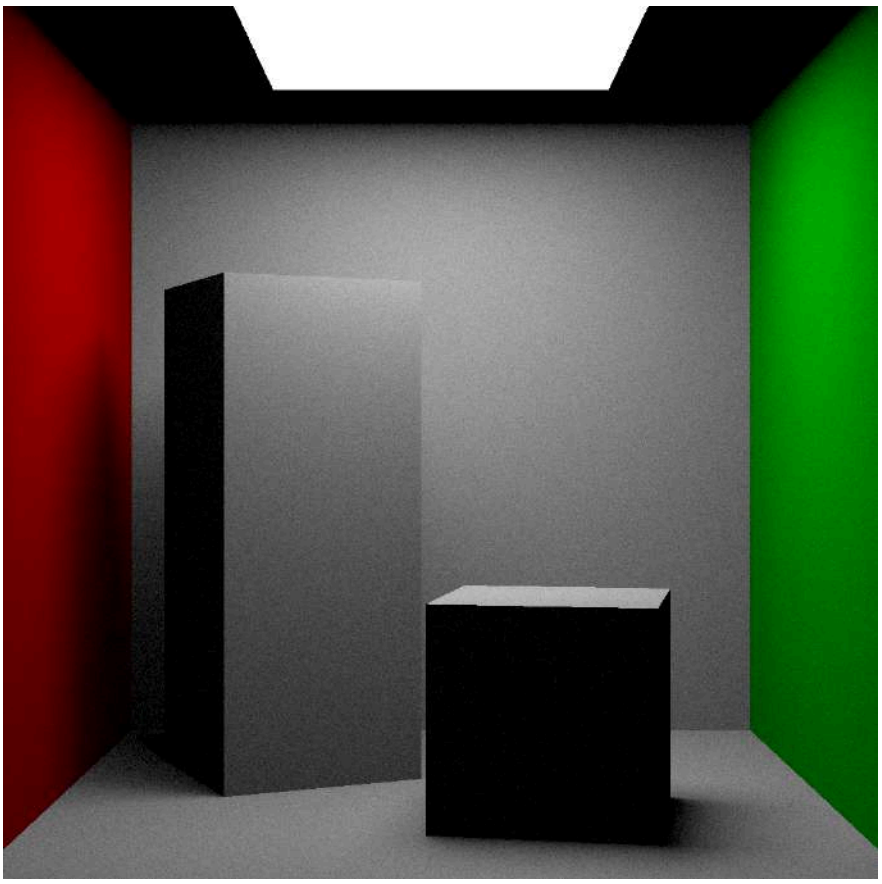

Big.json:

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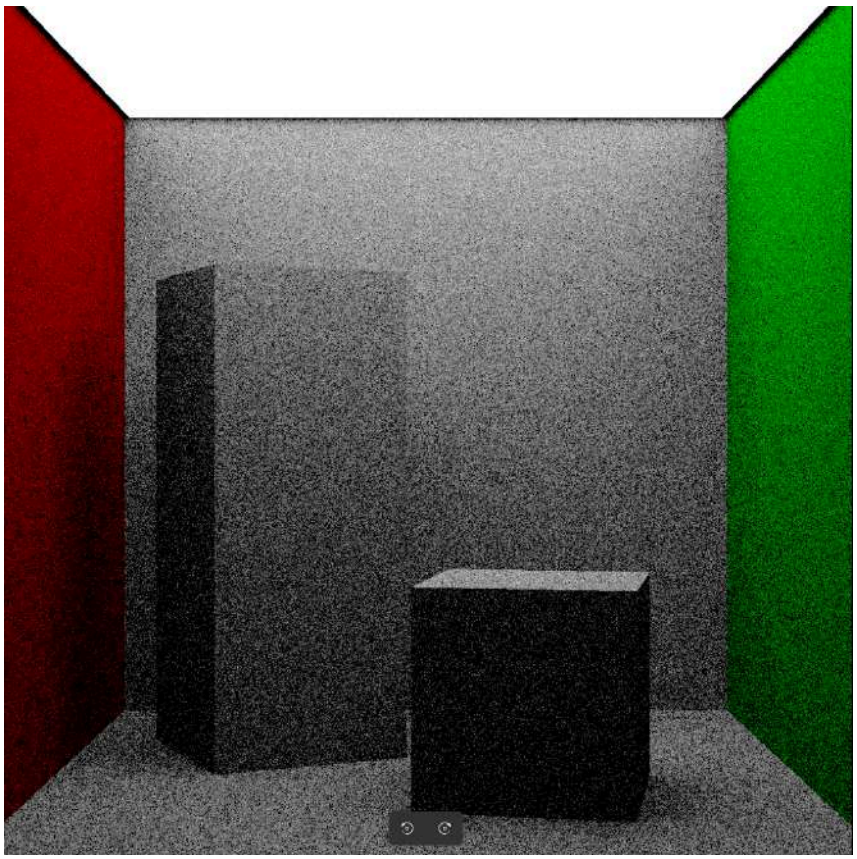

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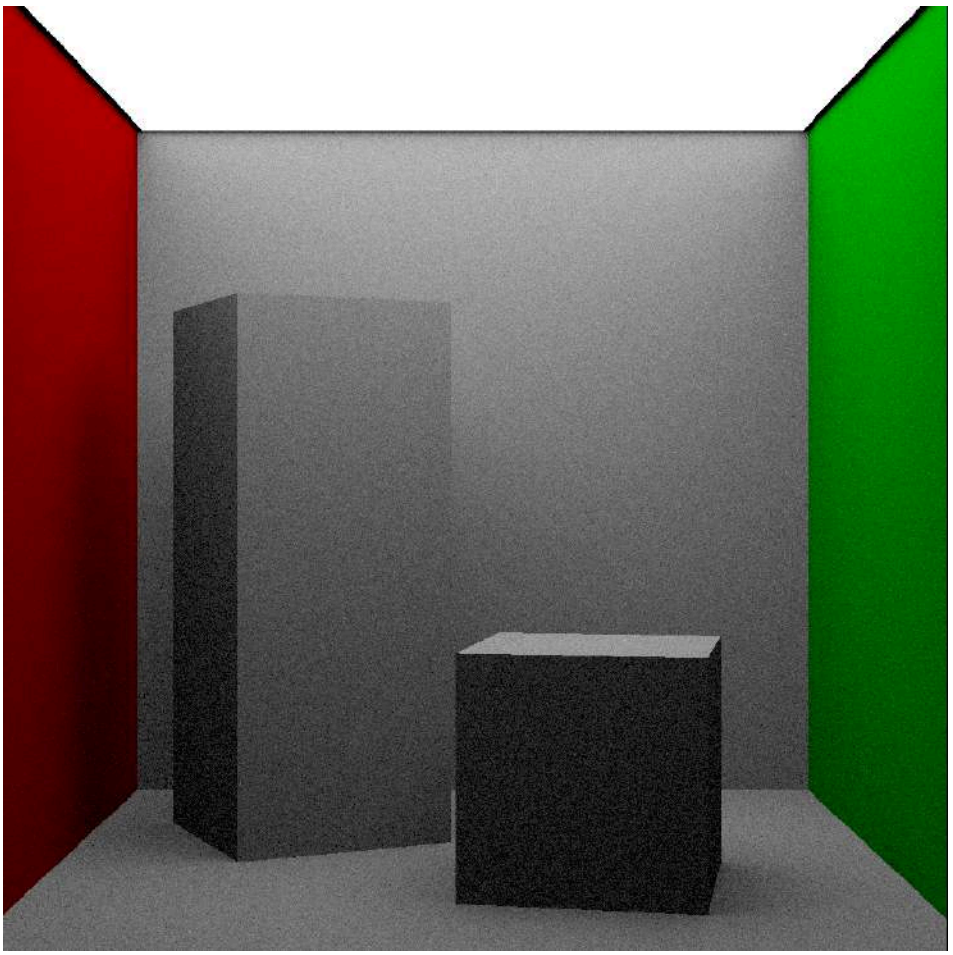

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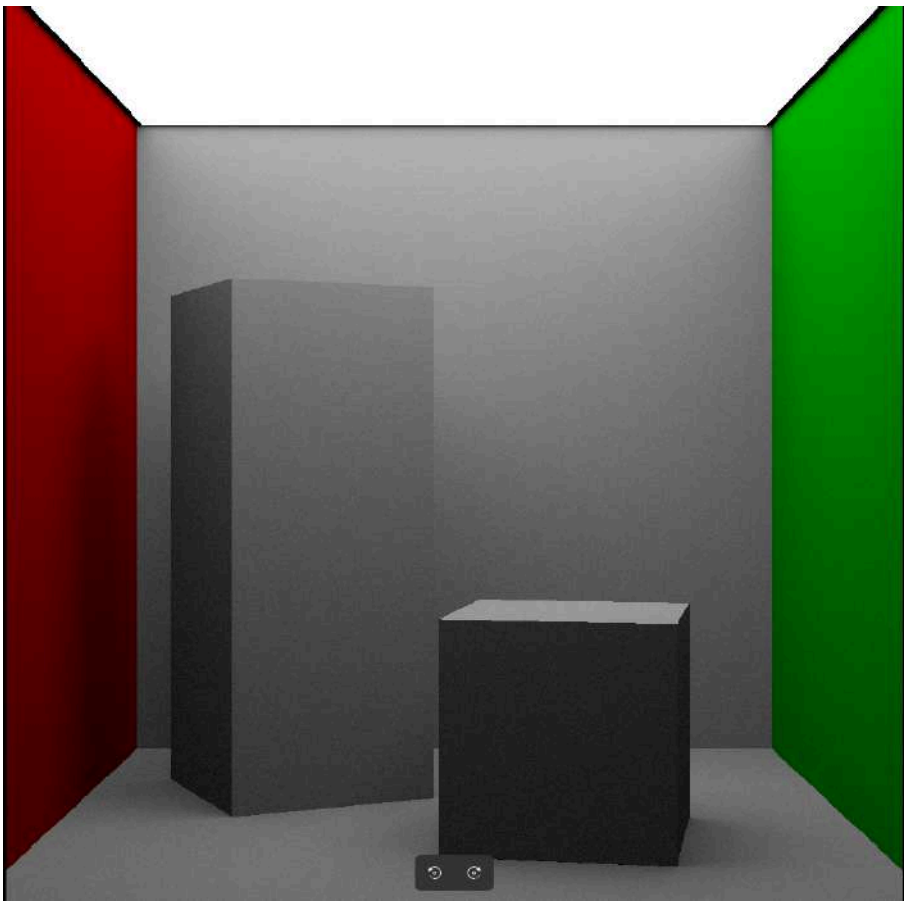

Many.json:

10 px
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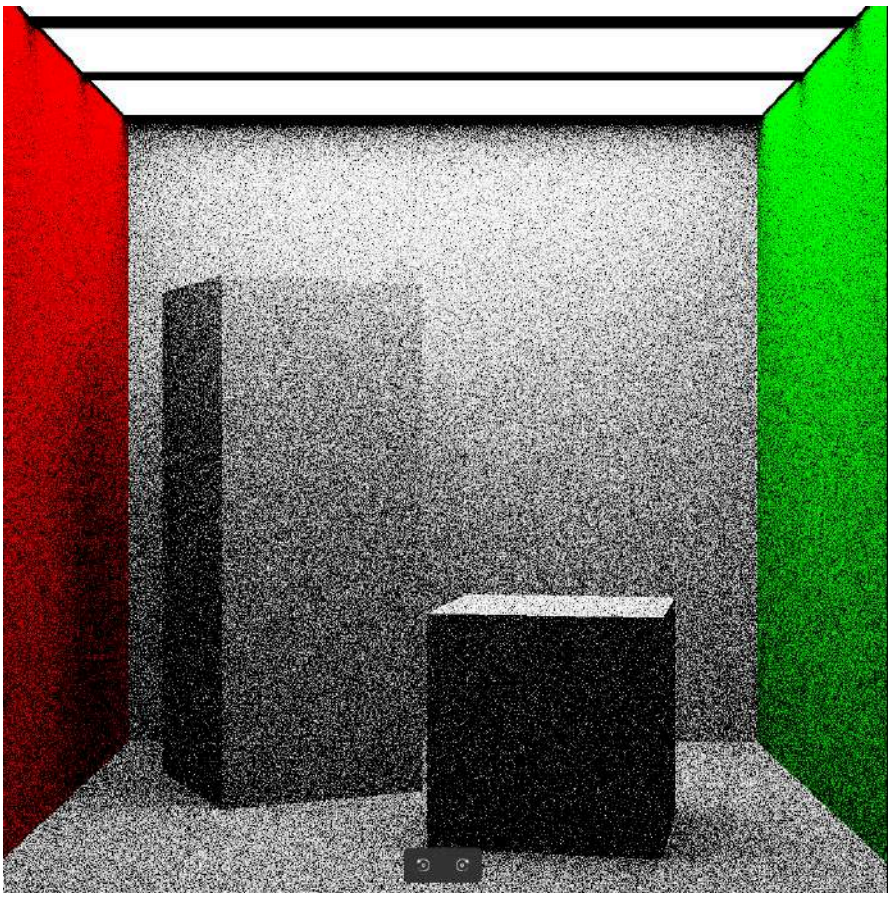

100 px
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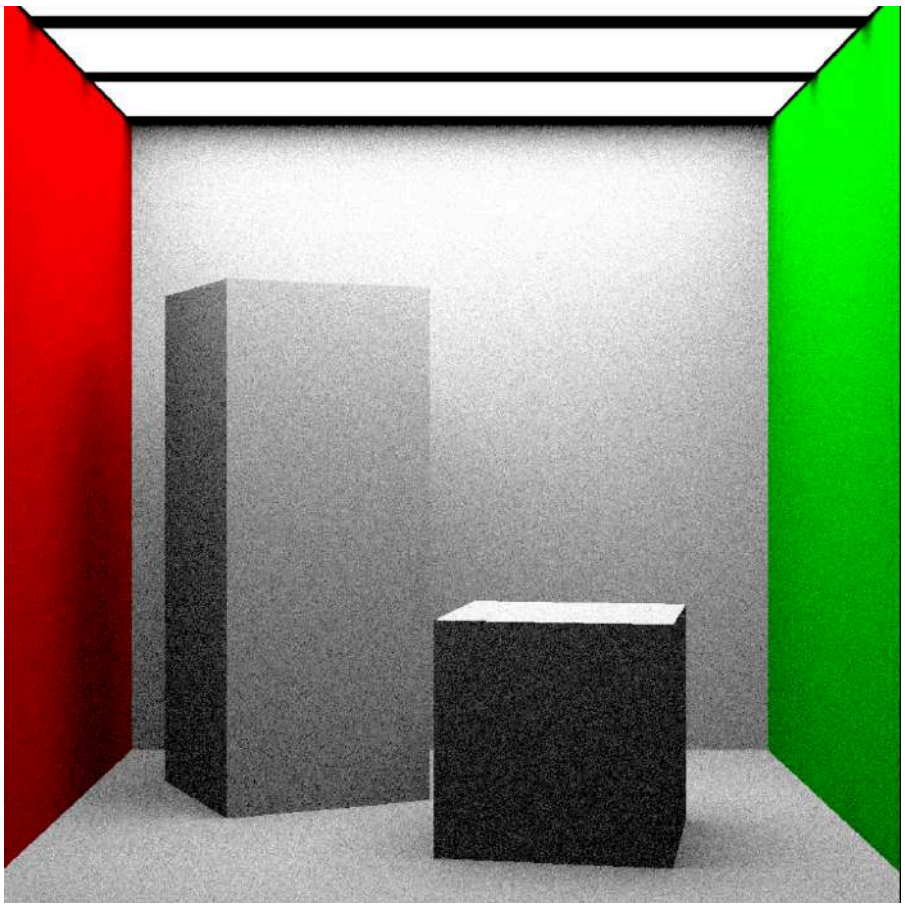

1000 px
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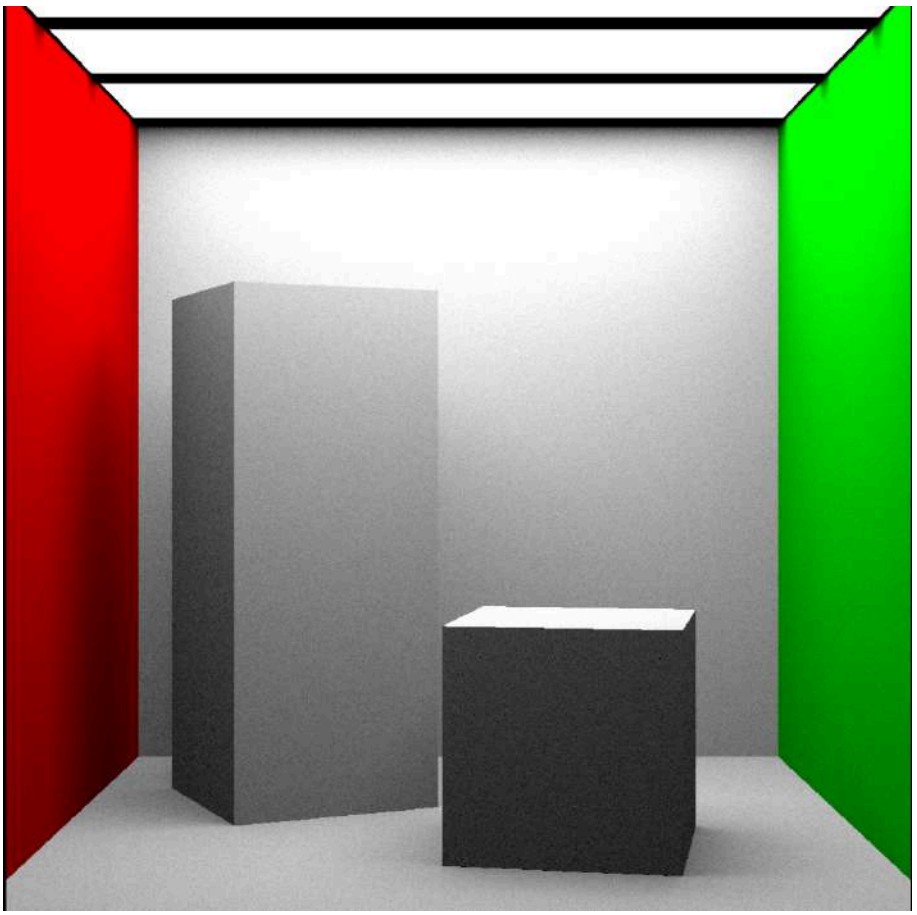
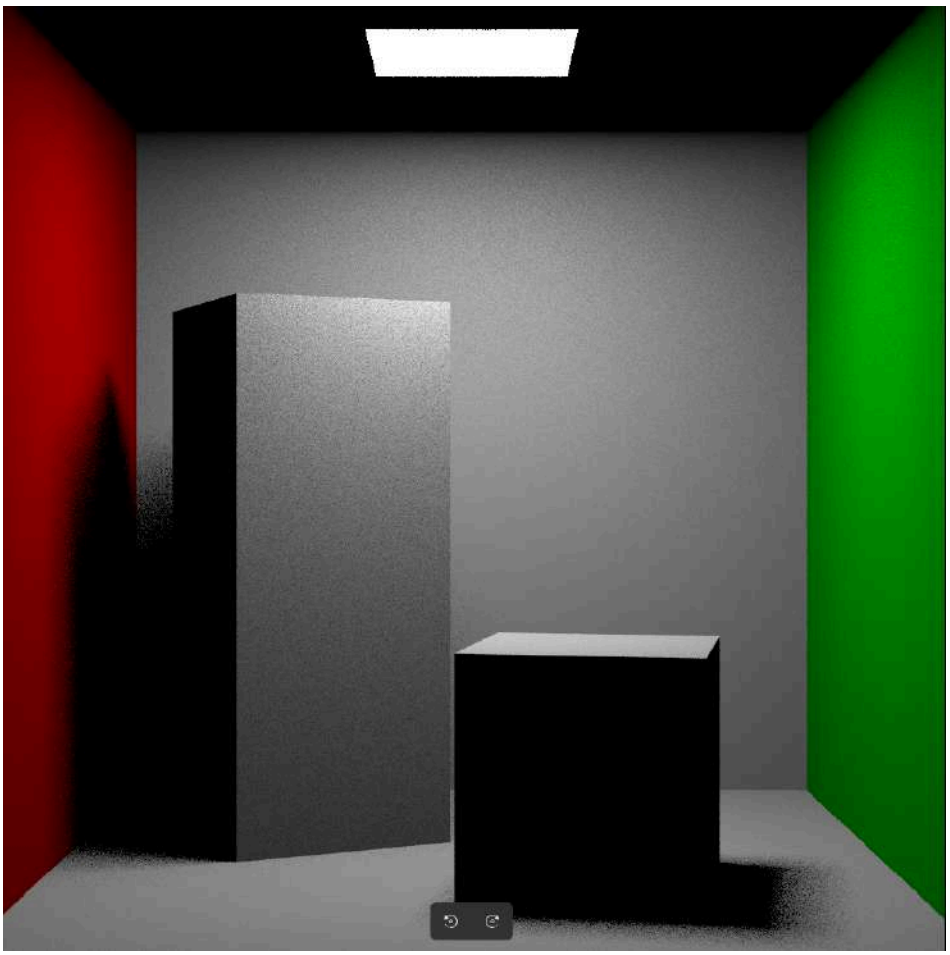


Light Sampling

Small.json:

10 px
Render Time: 17175.326172 ms



100 px
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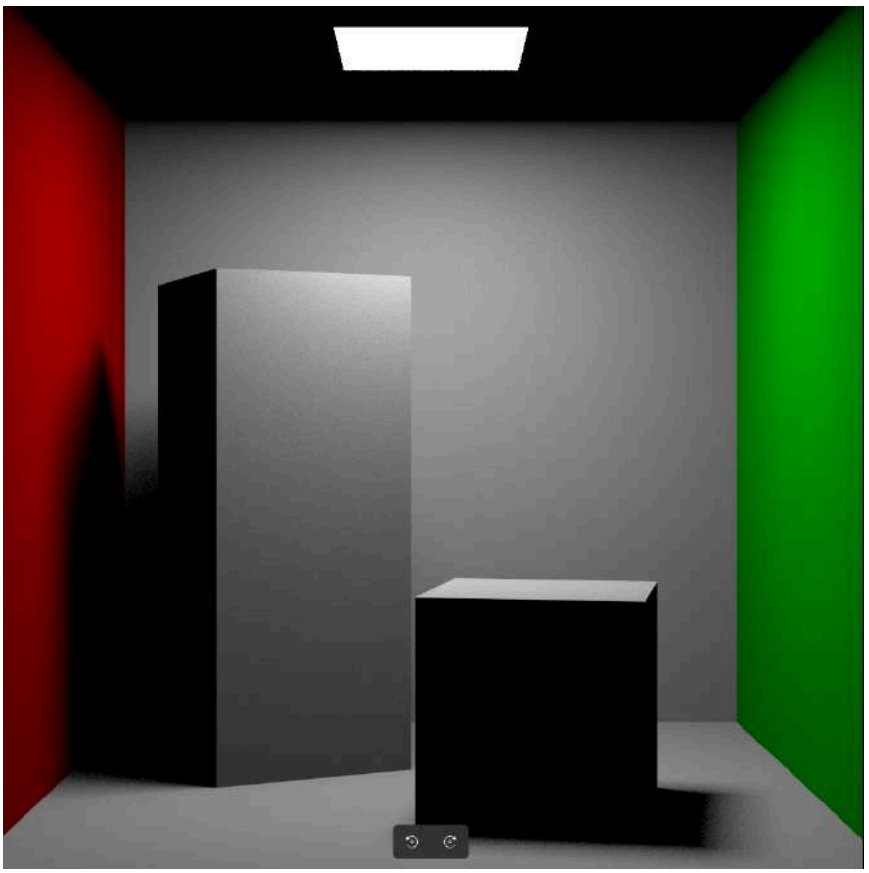

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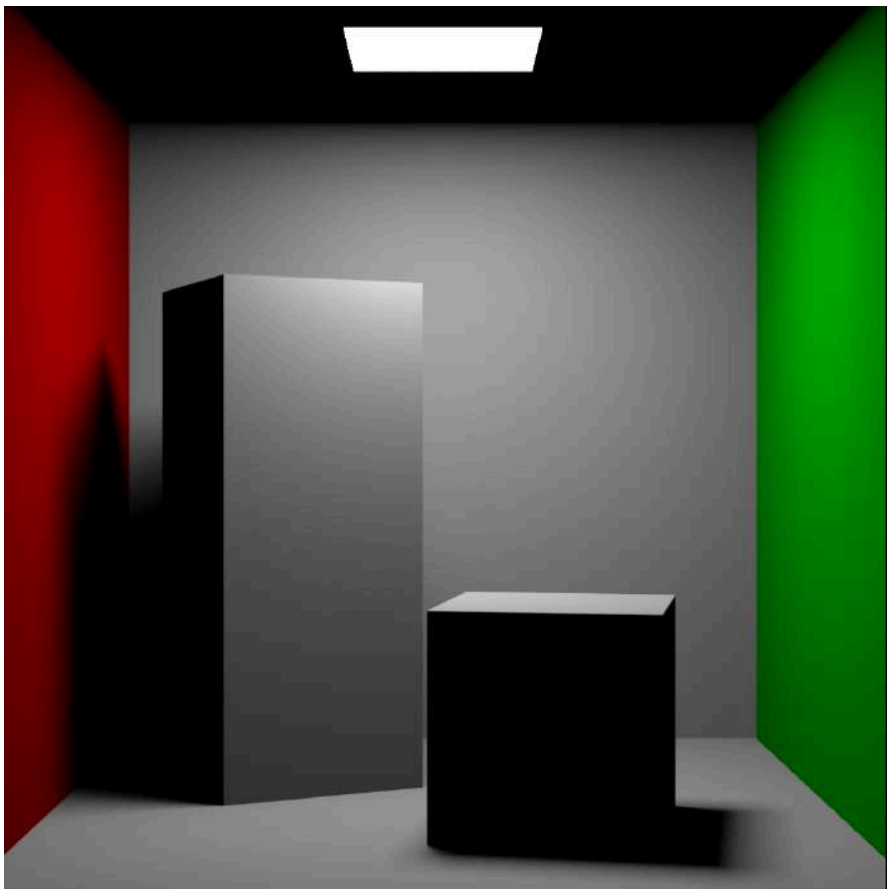

Med.json:

10 px
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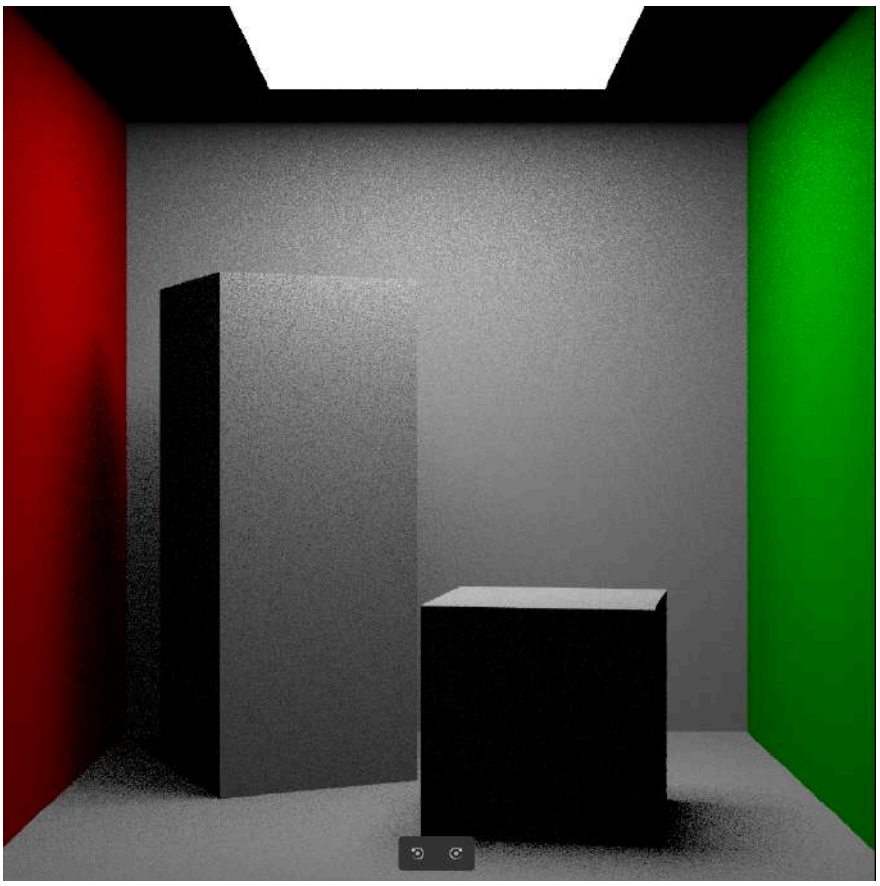
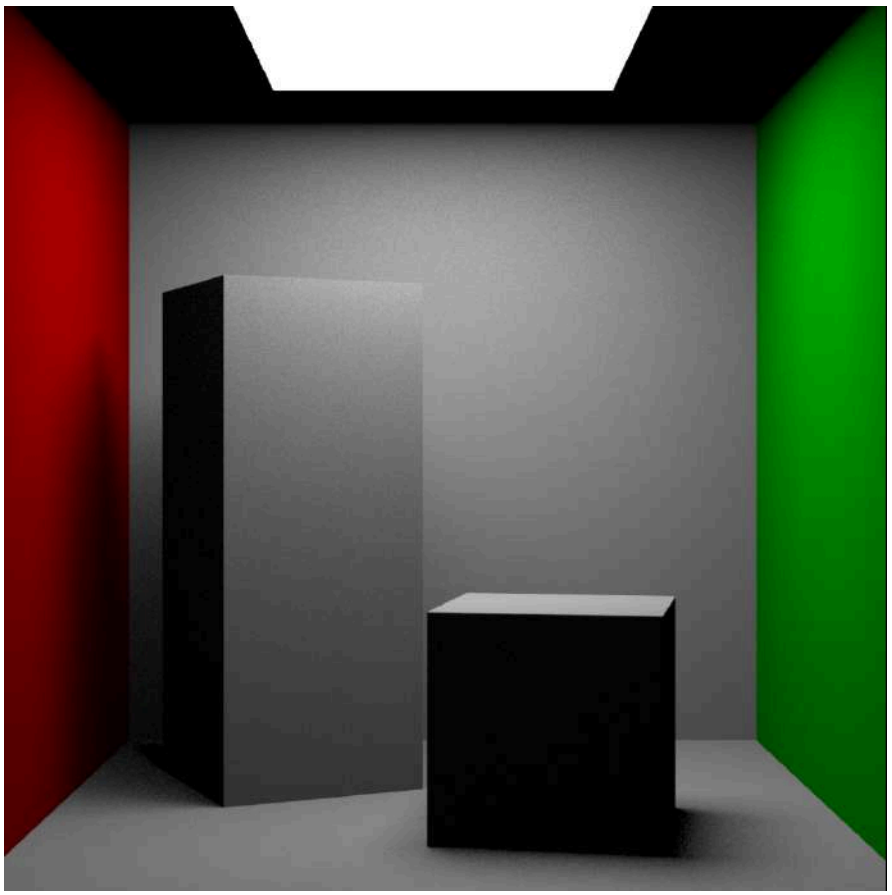


100 px
Render Time: 180584.640625 ms



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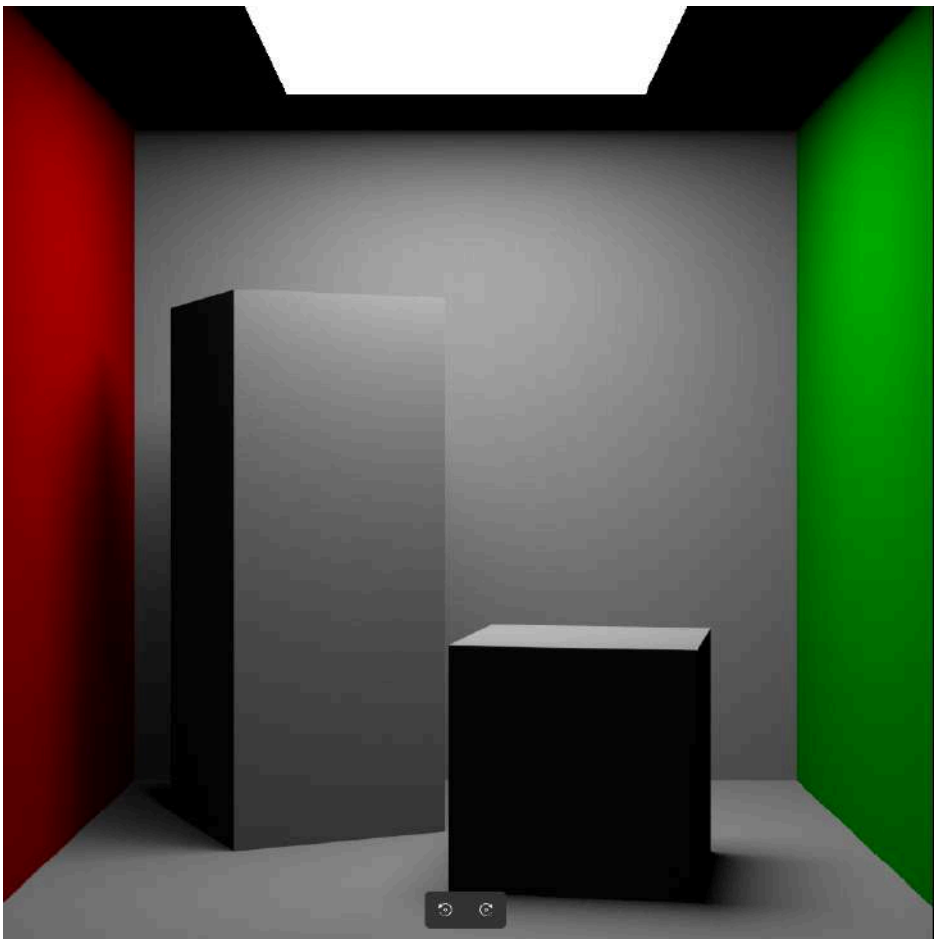

Big.json:

10 px
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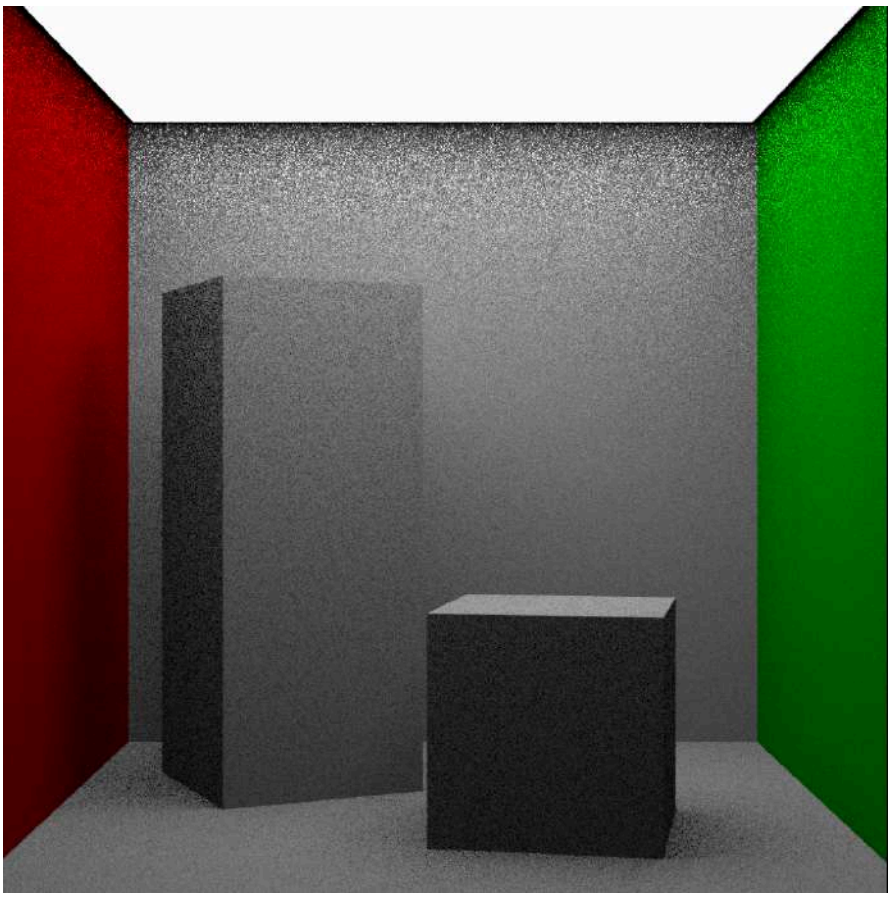

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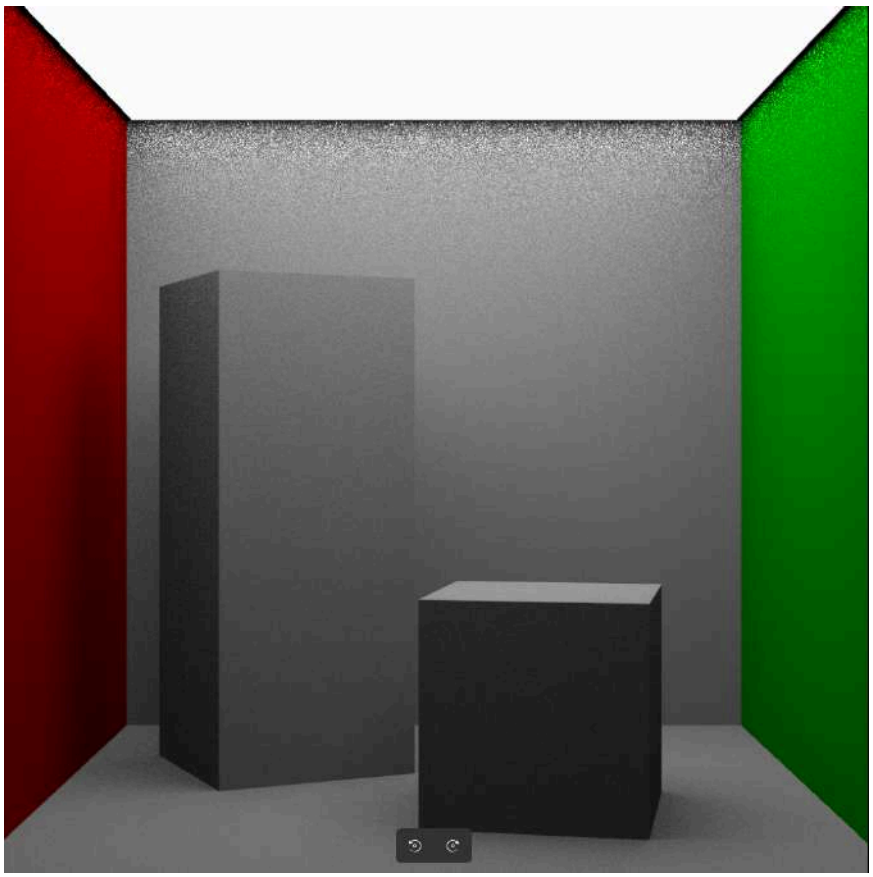

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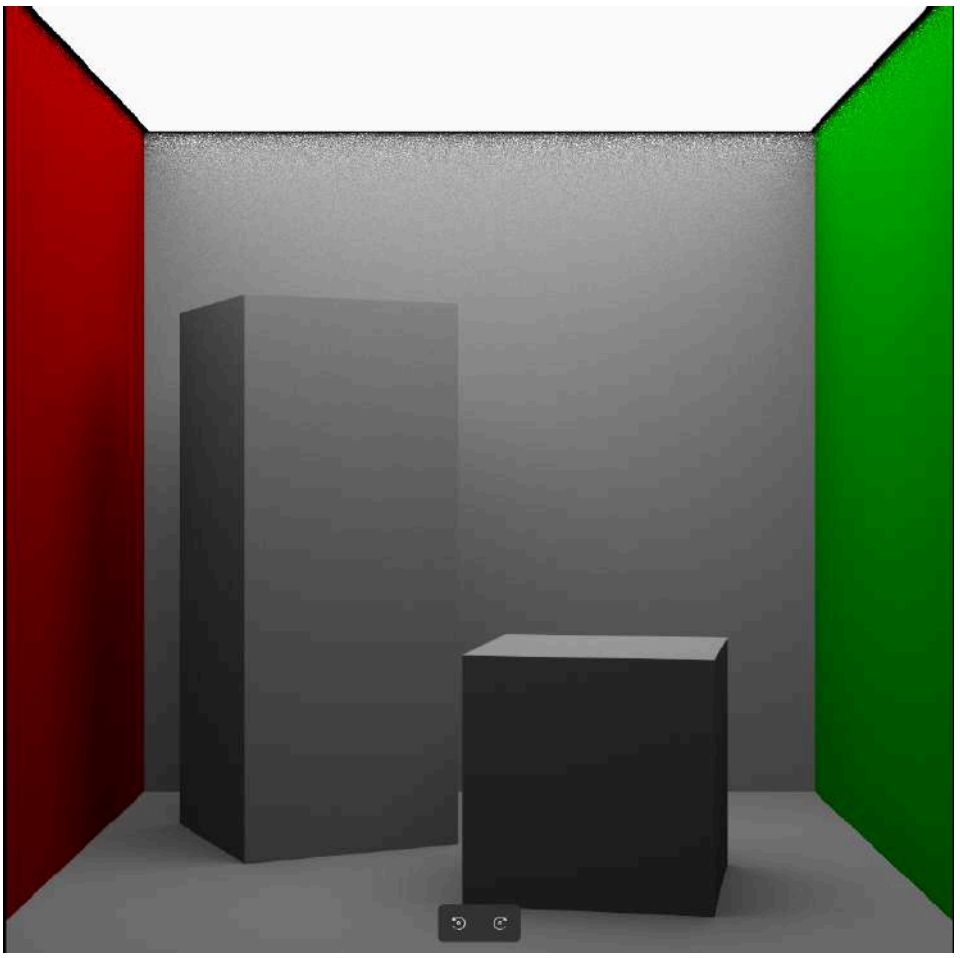
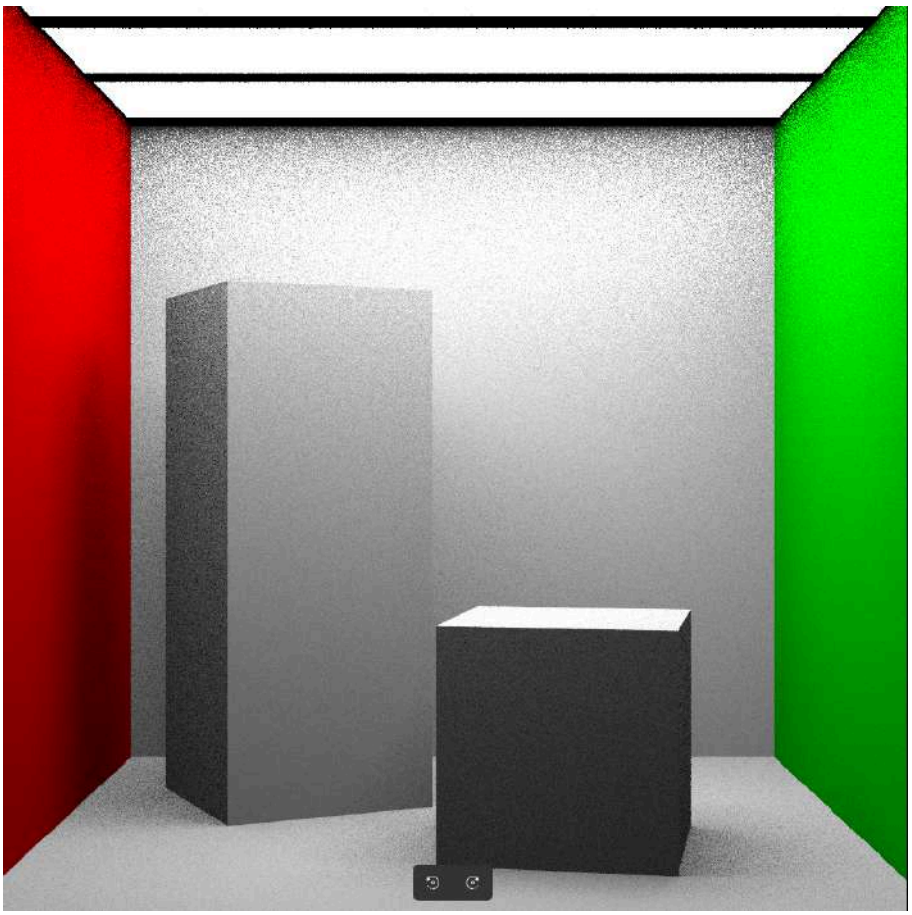
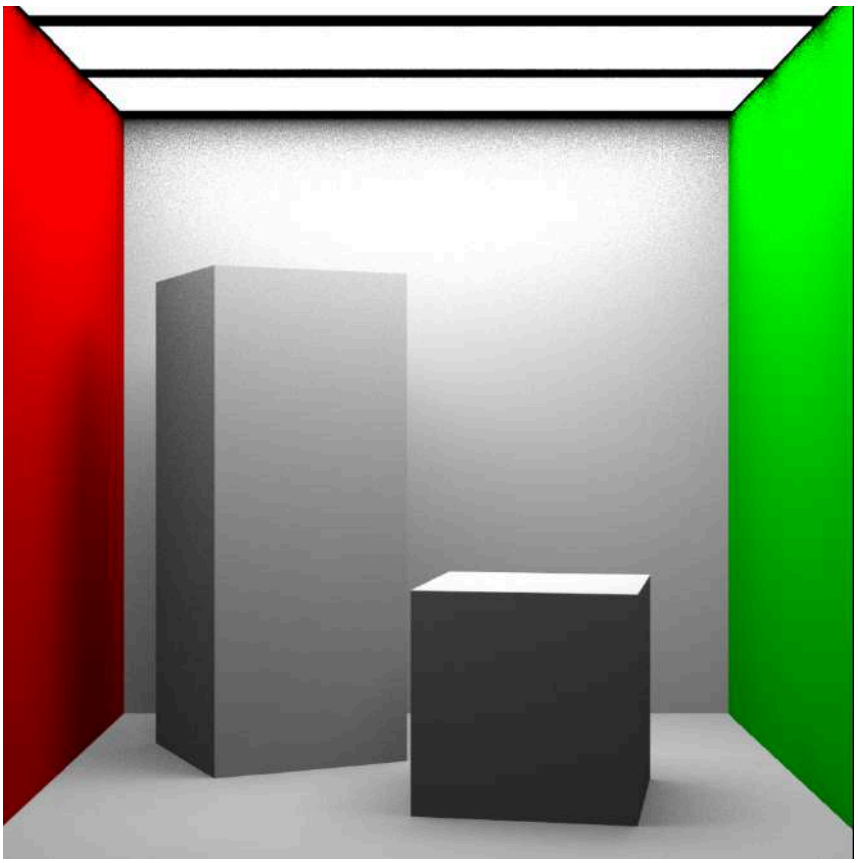


Many.json:

10 px
Render Time: 34754.847656 ms



100 px
Render Time: 297482.343750 ms



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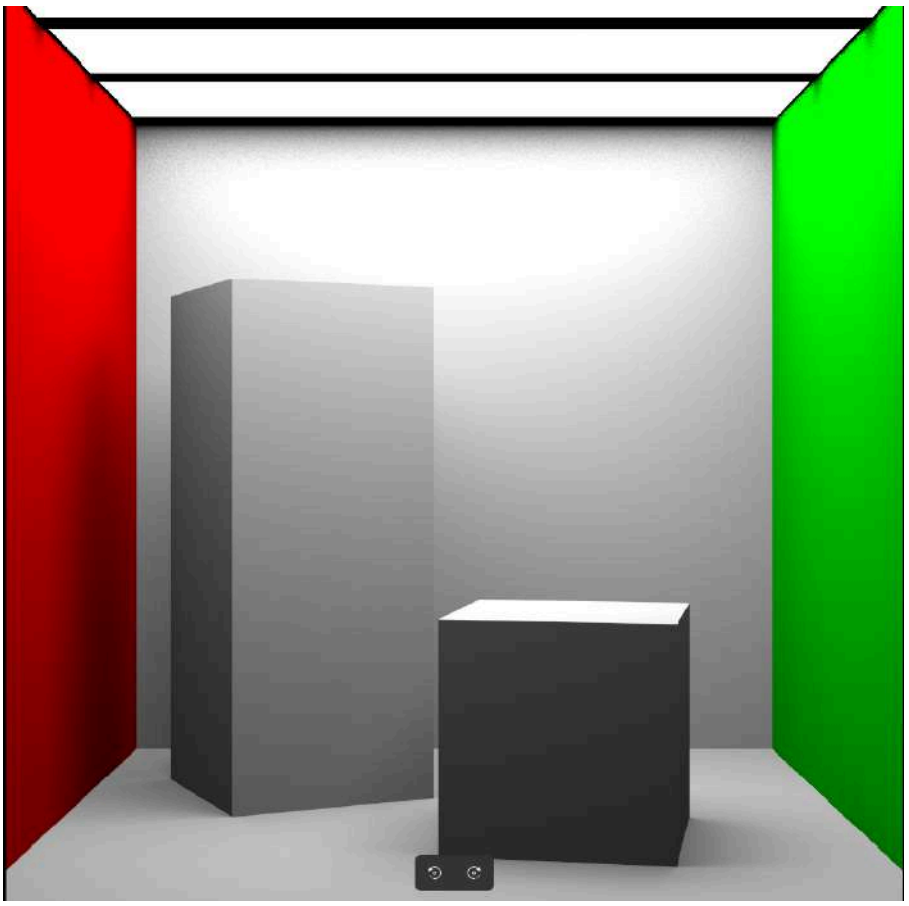

Questions:

1. Why can’t we render point and directional lights with uniform hemisphere sampling or cosine weighted sampling?

    A. Point lights emit light equally in all directions from a single point, while directional lights emit light uniformly from a specific direction. We can’t render point and directional lights with uniform hemisphere sampling or cosine weighted sampling because point and directional lights are infinitesimal lights and so they are points themselves (and not finite areas like area lights) which is why we cannot sample on these points because there is nothing to sample as the lights themselves are points.

2. Why does the noise increase for the same number of samples in the case of uniform hemisphere and cosine weighted sampling as the size of the area light decreases?

A. When the size of the area light decreases, the number of samples distributed over that smaller area remains the same, i.e the density of samples per unit area increases. In the case of uniform hemisphere sampling or cosine-weighted sampling, where samples are distributed over the area of the light source, the increased density of samples means that each sample has a higher probability of hitting a region of the light source that varies in intensity. So, the smaller the area, higher will be this variation and hence, more will be the noise.