CG Assignment-3 Report

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

  As we know point light has non- zero radiance only for one single point in space similarly for directional lights it has non-zero radiance value only for single direction in space.

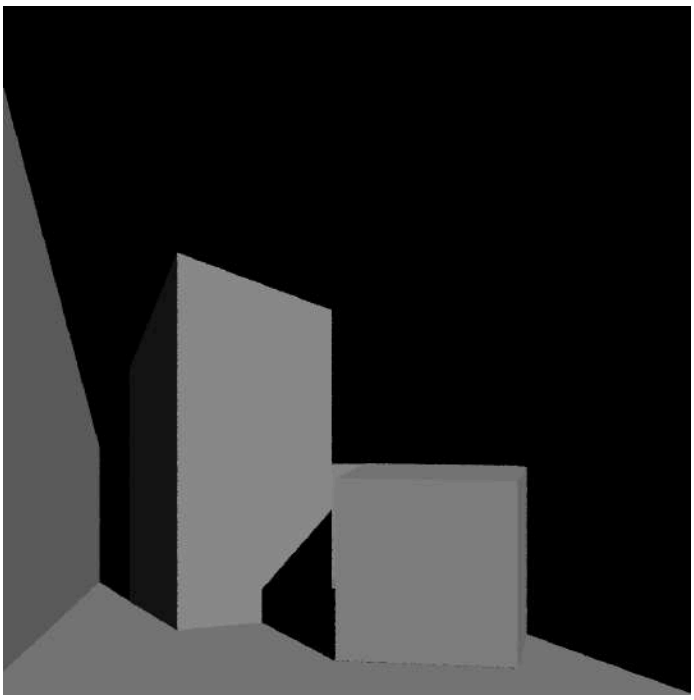
  In uniform hemisphere sampling and cosine sampling we sample the directions using uniform and cosine probability functions and the probability of sampling the same direction equal to direction of directional light is zero.similarly sampling the directions in which point light lies is also zero.So sampled w_i will never hit the point light in case of point light and will never have the same direction as the directional light in case of directional light. That's why we can’t render point and directional lights with uniform hemisphere sampling or cosine weighted sampling.

- **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?**

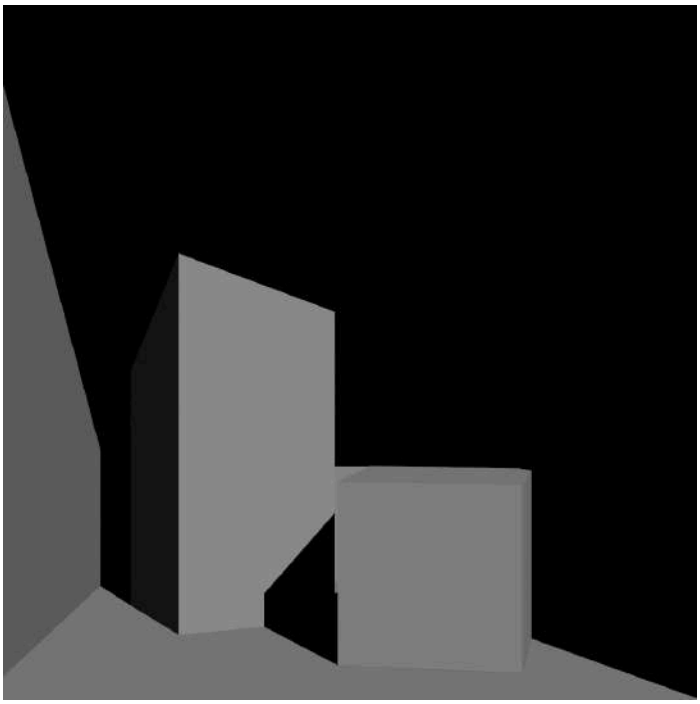
  As the size of Area light decreases small number of samples likely to hit the light i.e the probability of random sample hitting the light decreases so renderer has less opportunity to captures the light intensity that’ why we see higher noise as size of area light decreases for the same number of samples.

Question-2:

For spp=1, rendering time = 1.58s



For spp=32, rendering time = 32.4s

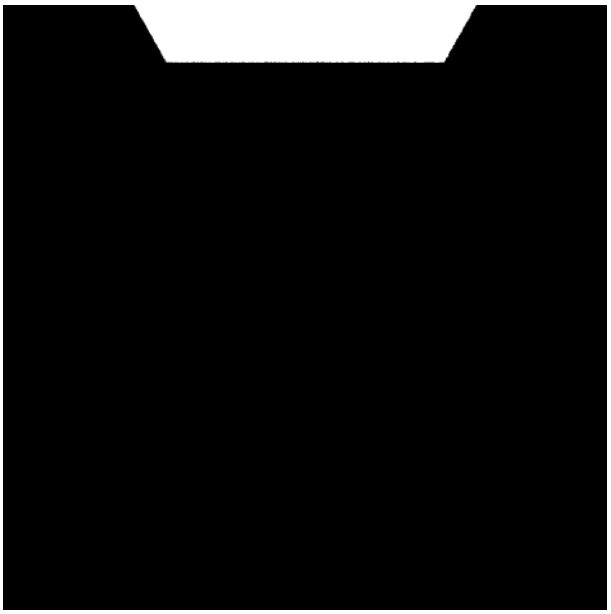


Question-3:

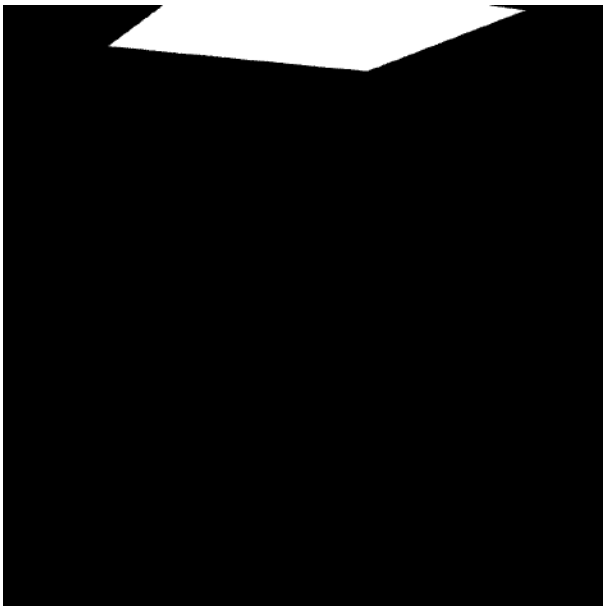
	scene1	scene2	scene3	scene4
Time	15.1s	15.2s	15.1s	15.7s

Rendered Images : (Rendered at 32 spp)

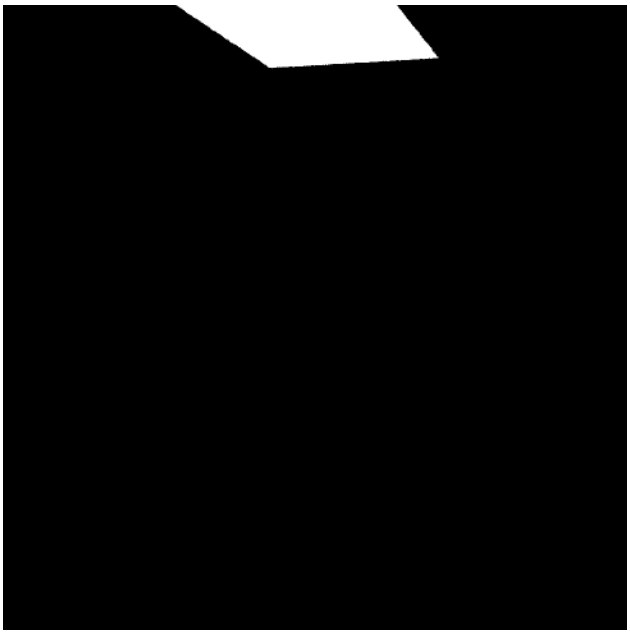
Scene1:



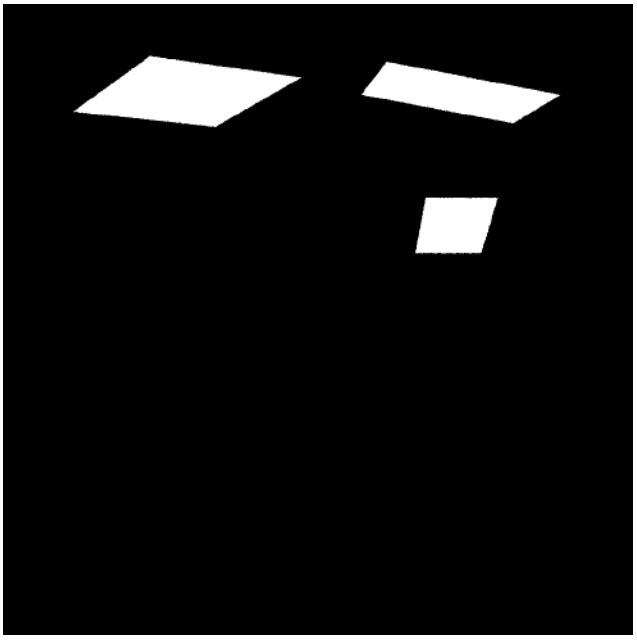
Scene2:



Scene3:



Scene4:



Question-3:

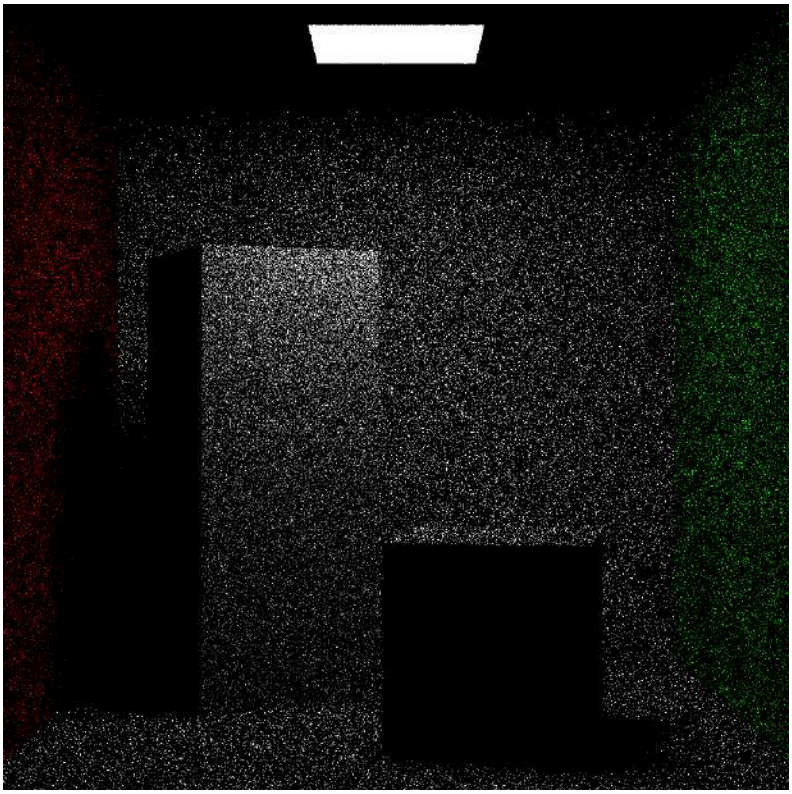
spp = 10

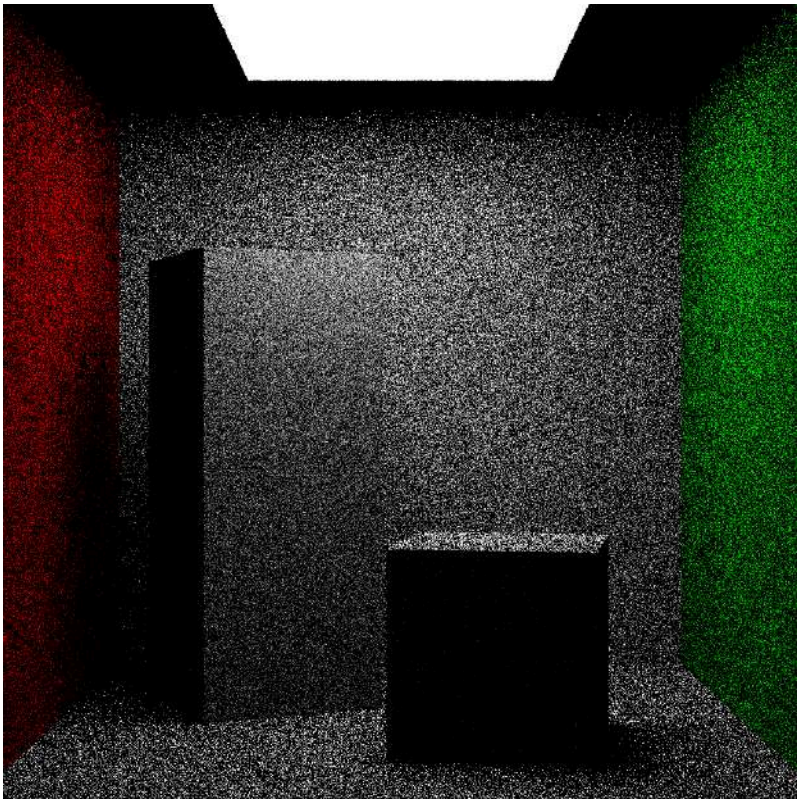
Rendering times :

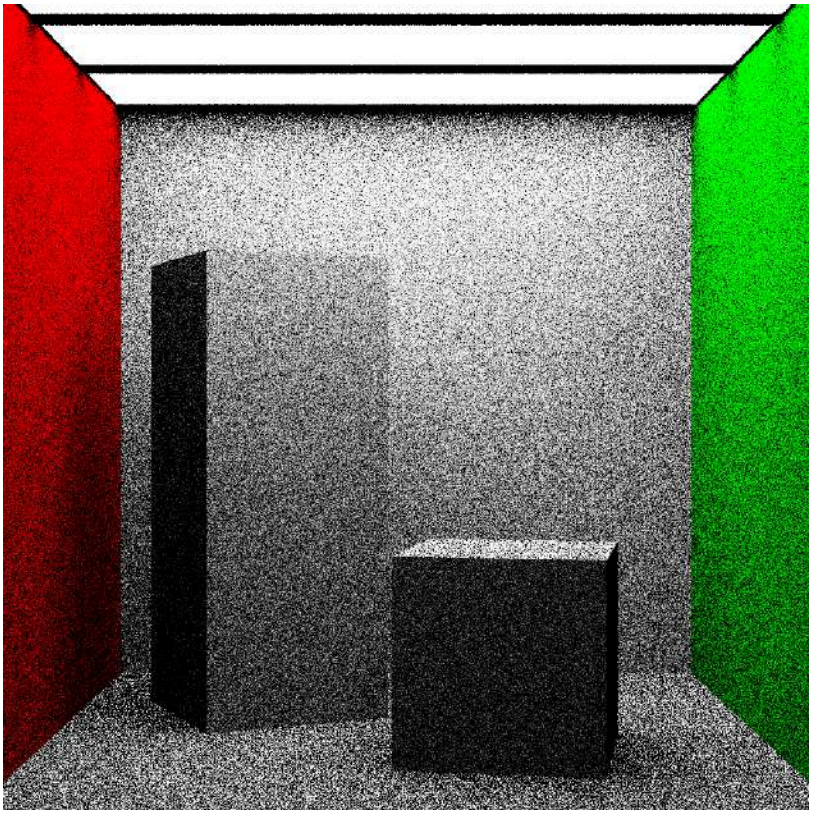
Variant \ scene	Small light	Medium light	Many lights	Big light
Uniform hemisphere sampling	12.5s	11.9s	18.1s	14.5s
Cosine sampling	12.7s	13.9s	15.8s	13.9s
Light sampling	10.2s	12.2s	12.1s	12.1s

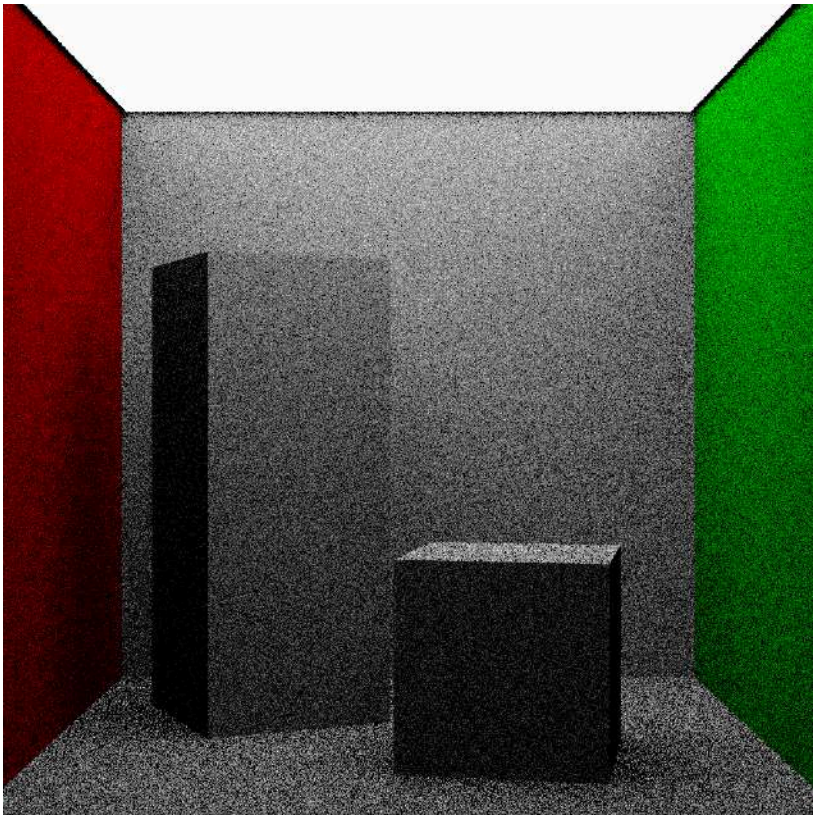
Rendered Images:

1.Uniform hemisphere sampling :

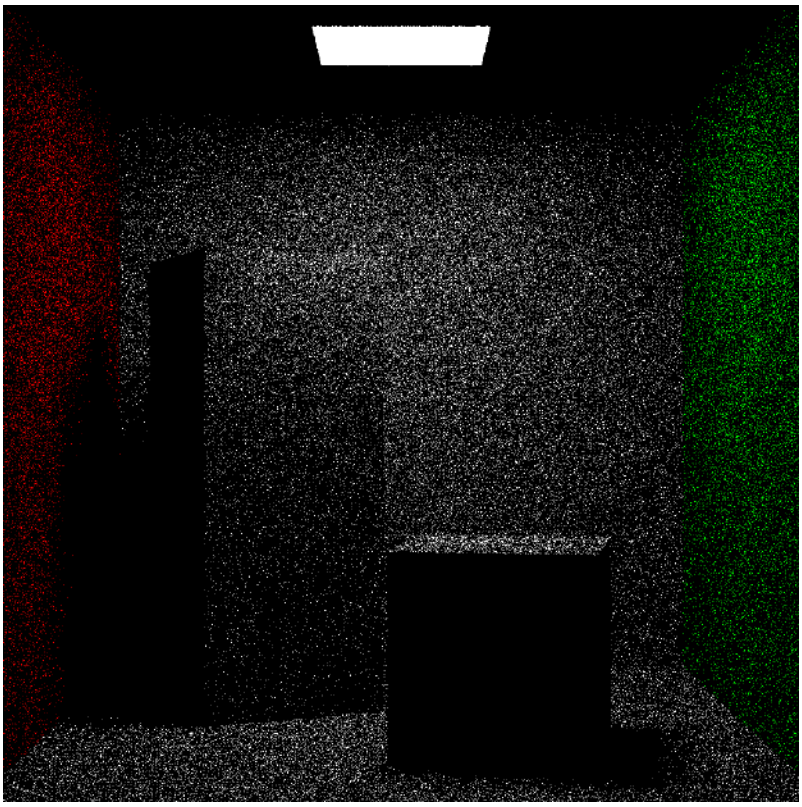


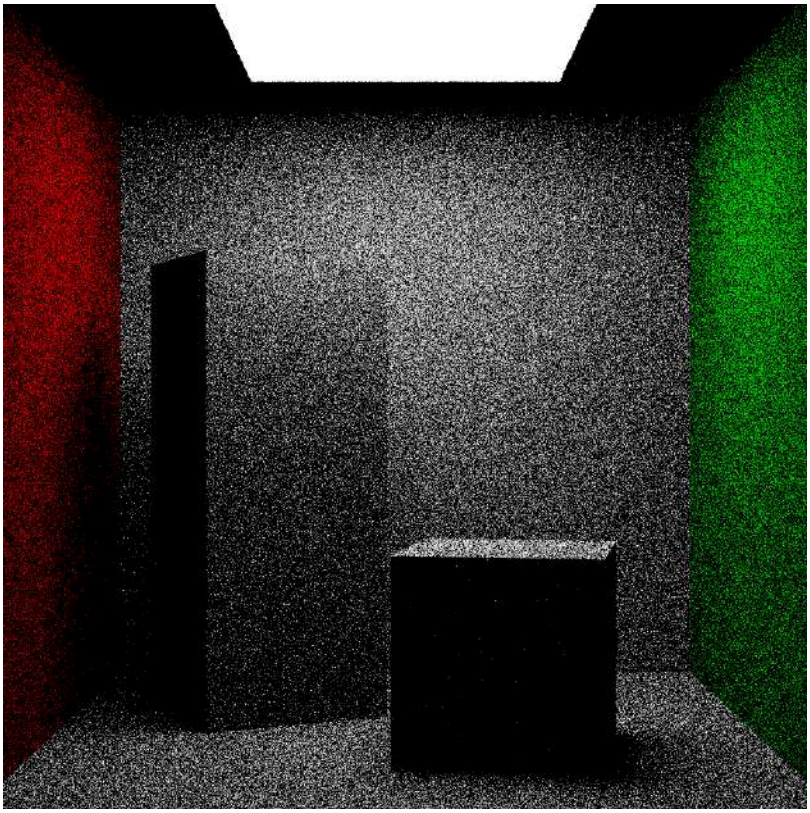


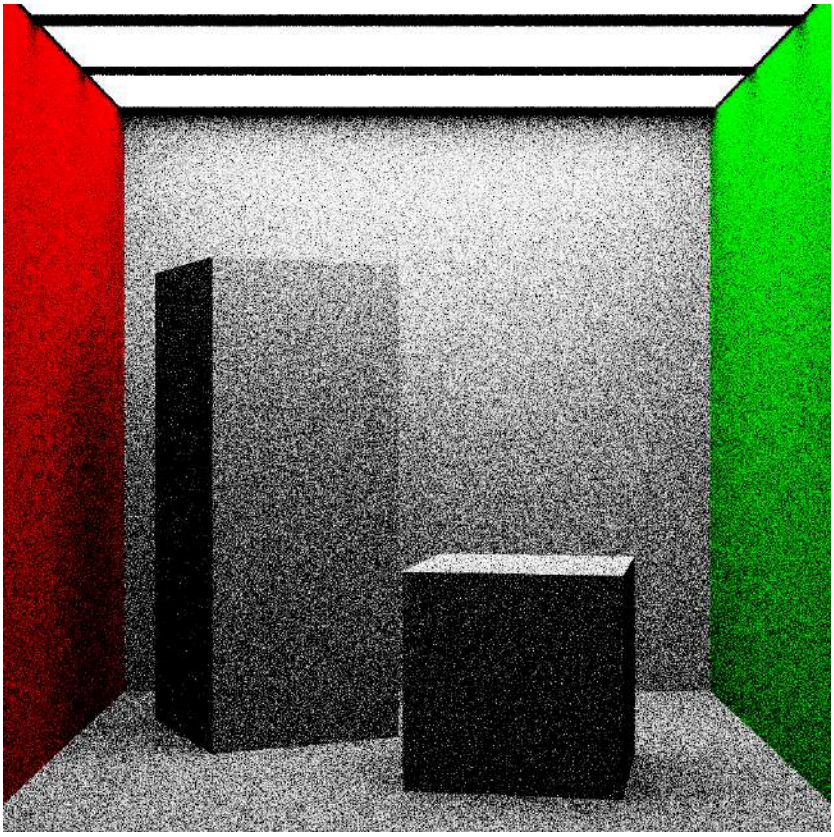


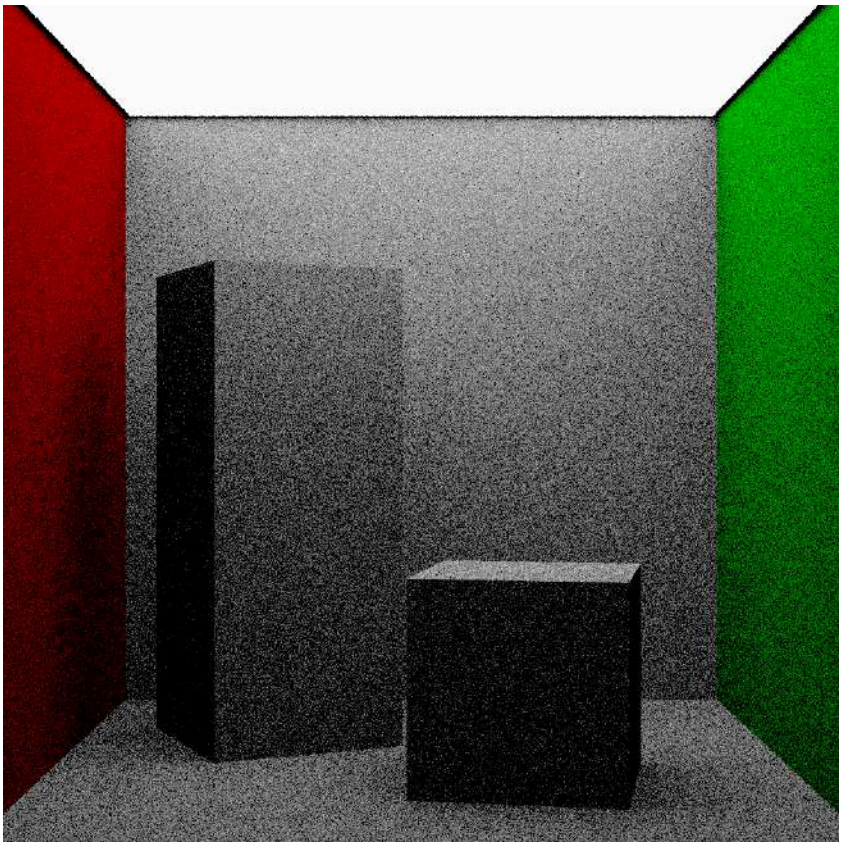


2.Cosine sampling:

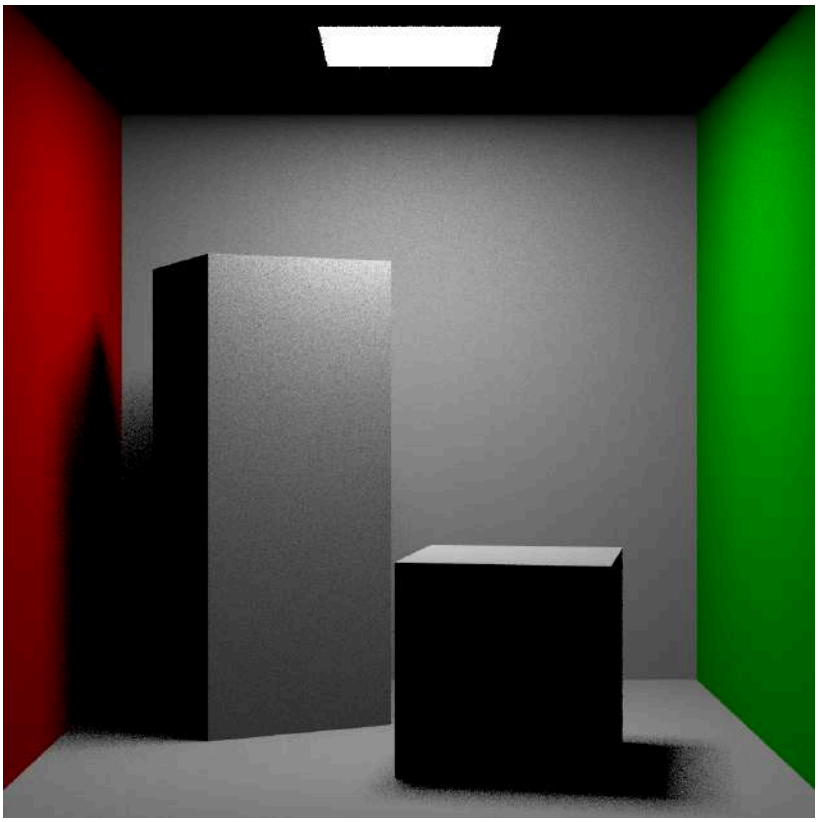


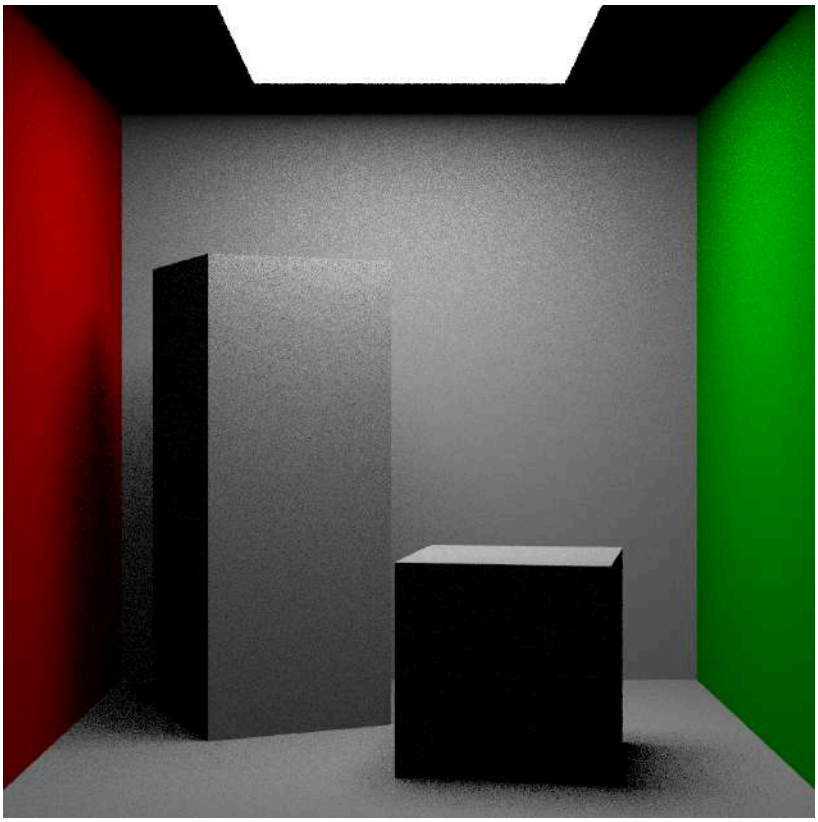


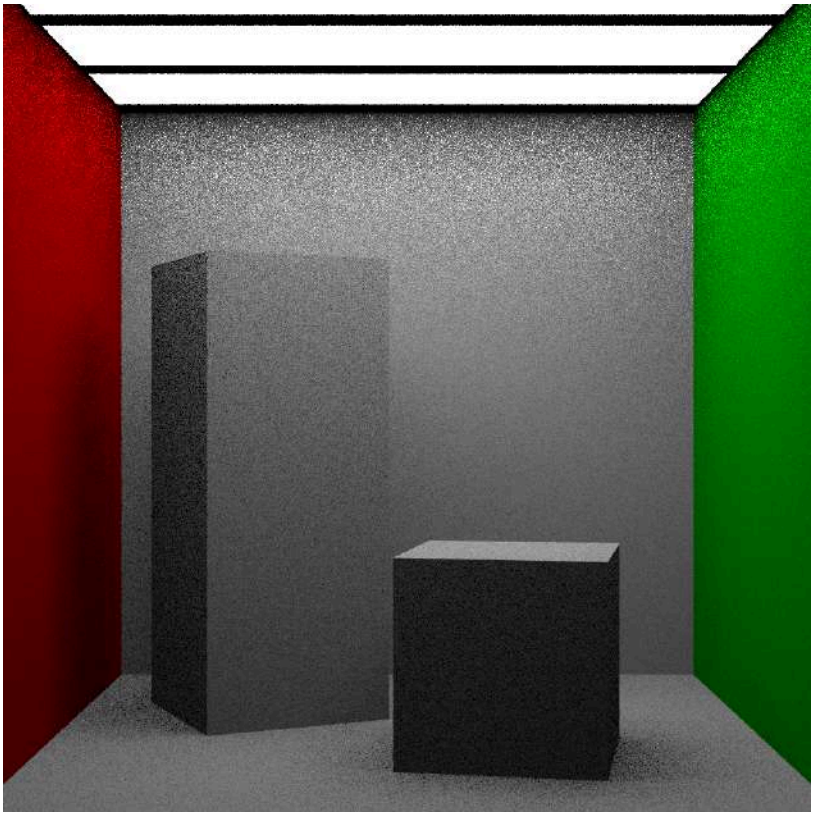


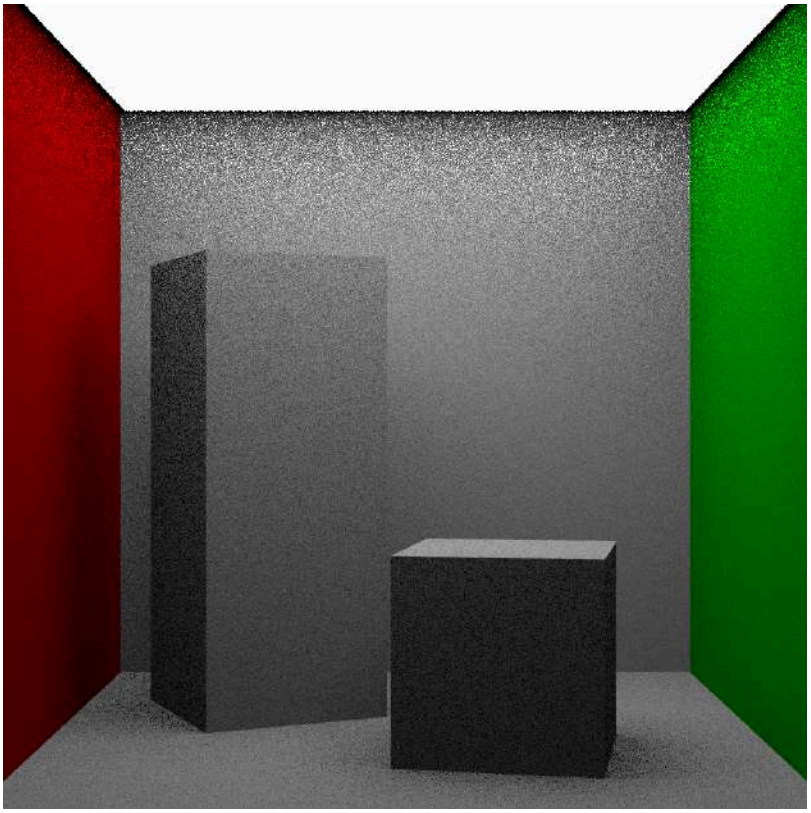


3.Light sampling:









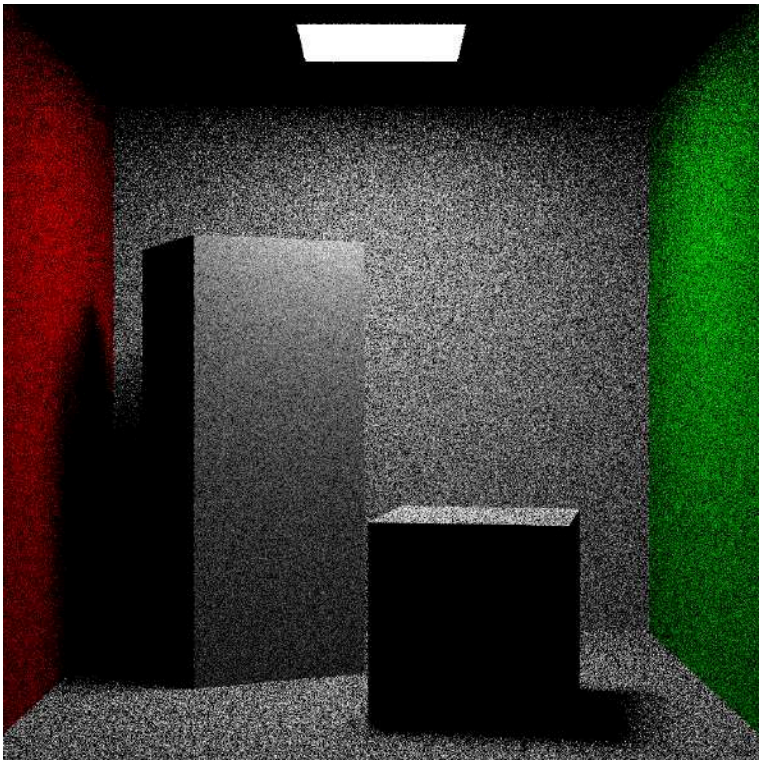
spp = 100

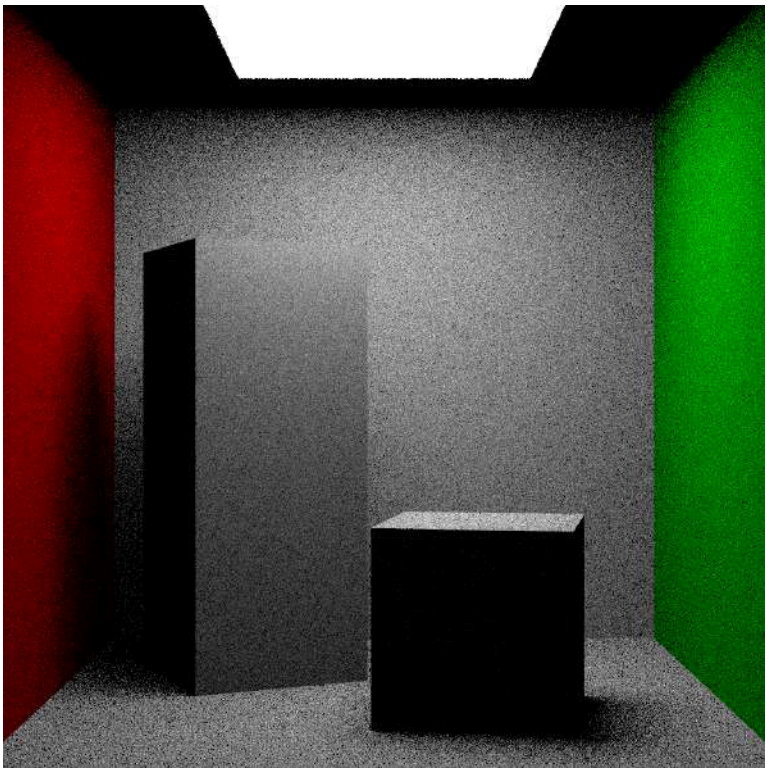
Rendering time :

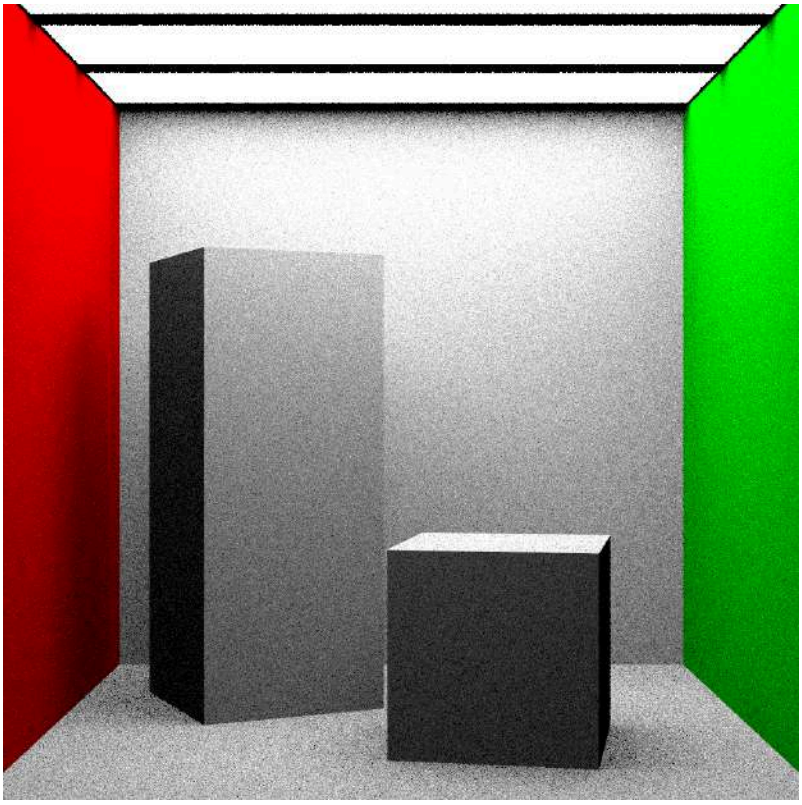
	Small light	Medium light	Many lights	Big light
Uniform hemisphere sampling	128.2s	118.5s	137.7s	119.9s
Cosine sampling	117.4s	116.9s	137..8s	114.5s
Light sampling	118.1s	125.7s	123.9 s	123.7s

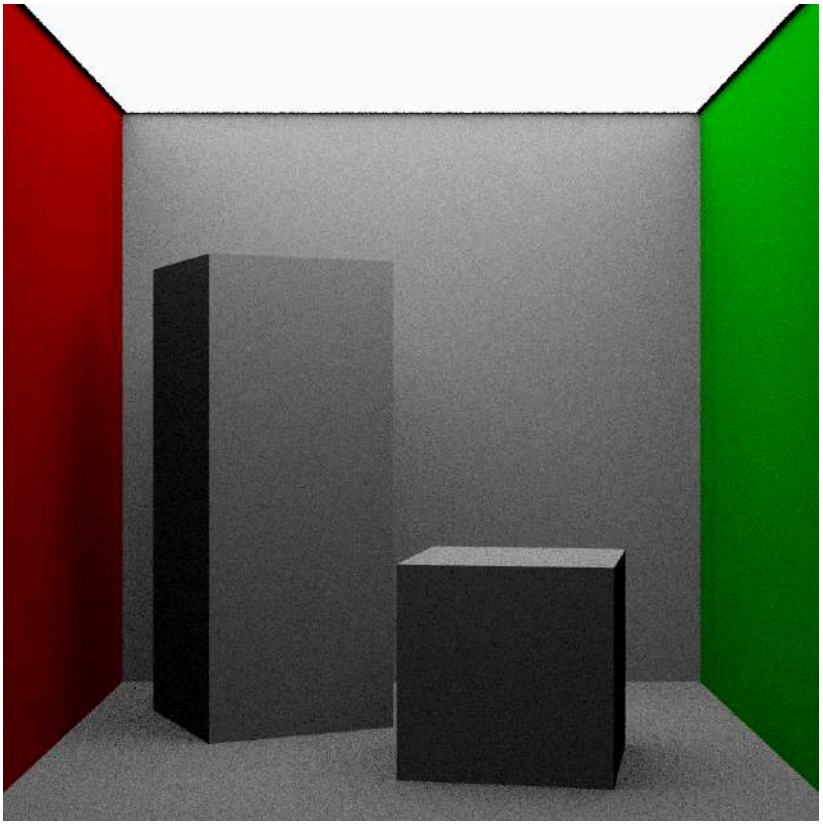
Rendered Images :

1.Uniform hemisphere sampling :

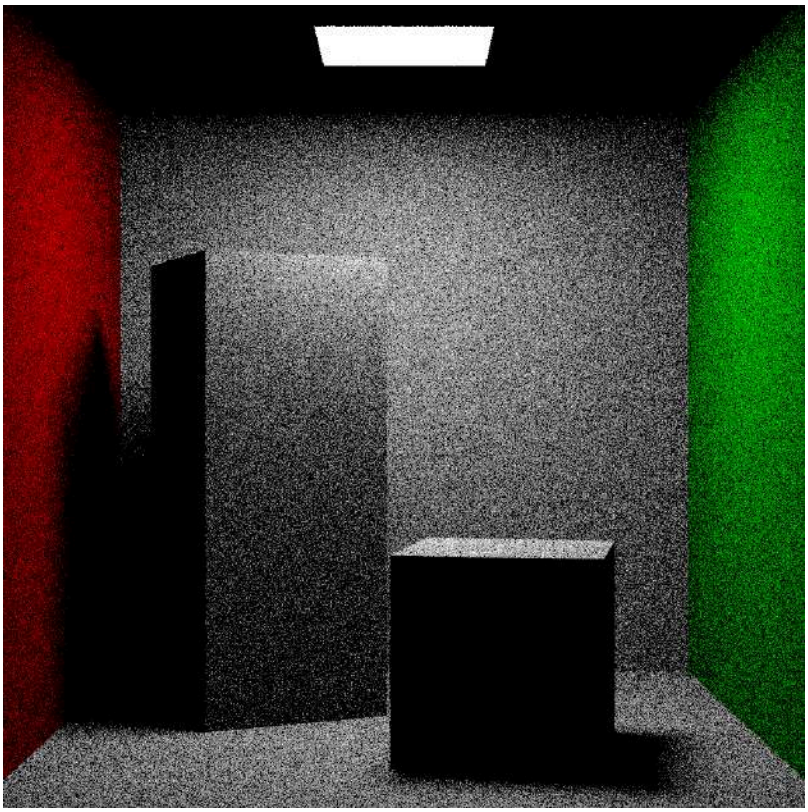


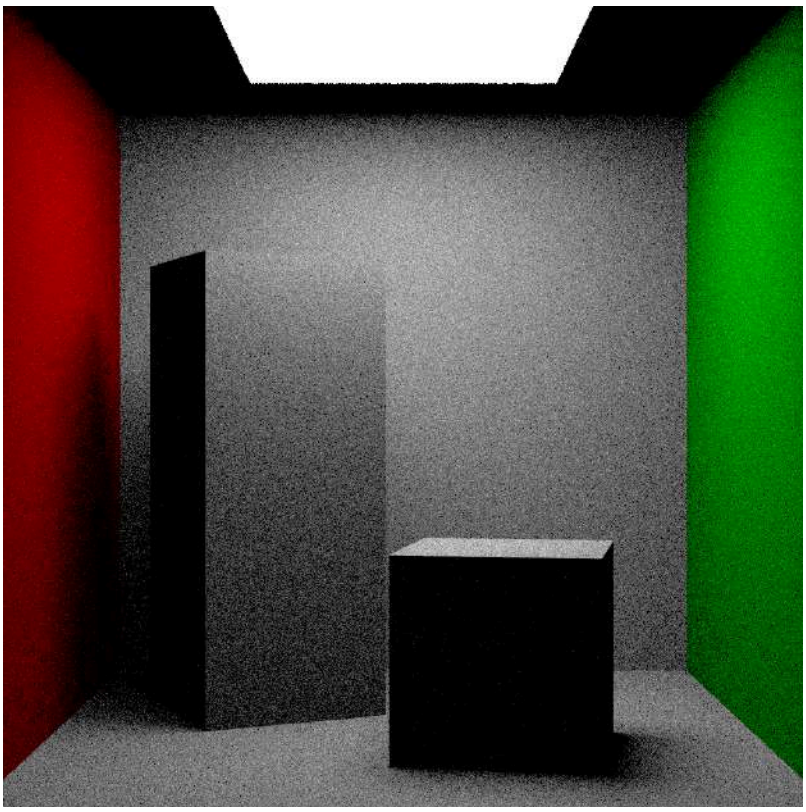


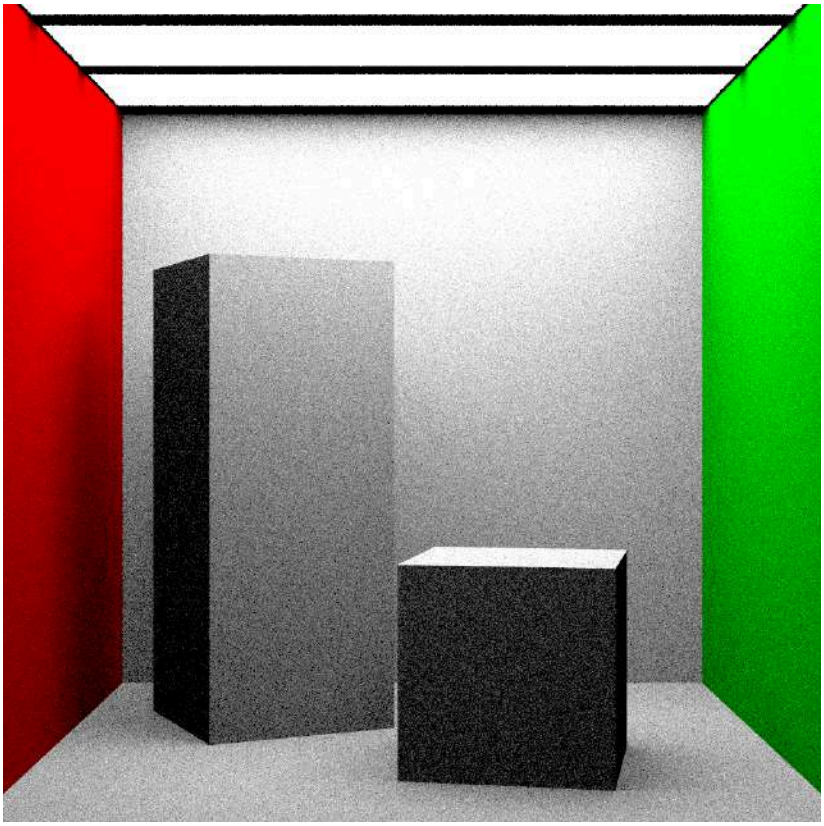


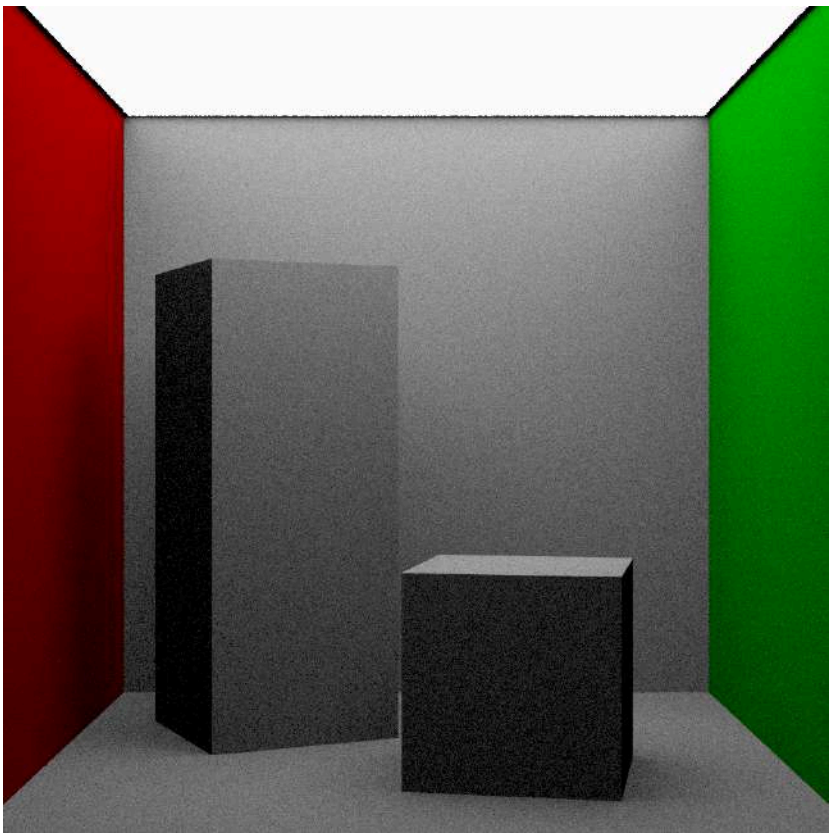


2.Cosine sampling:

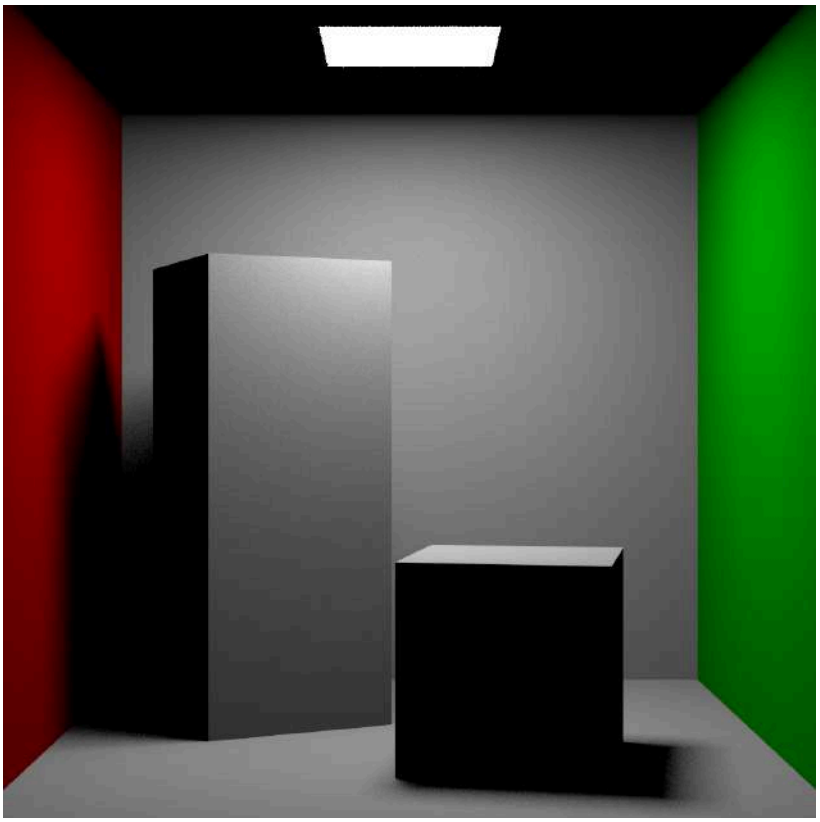


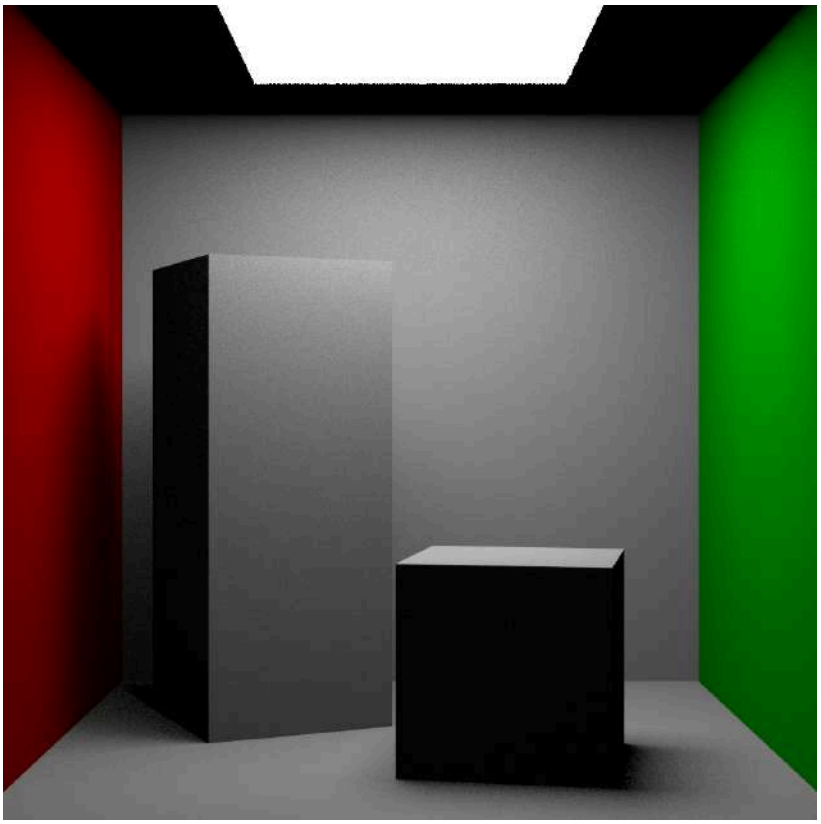


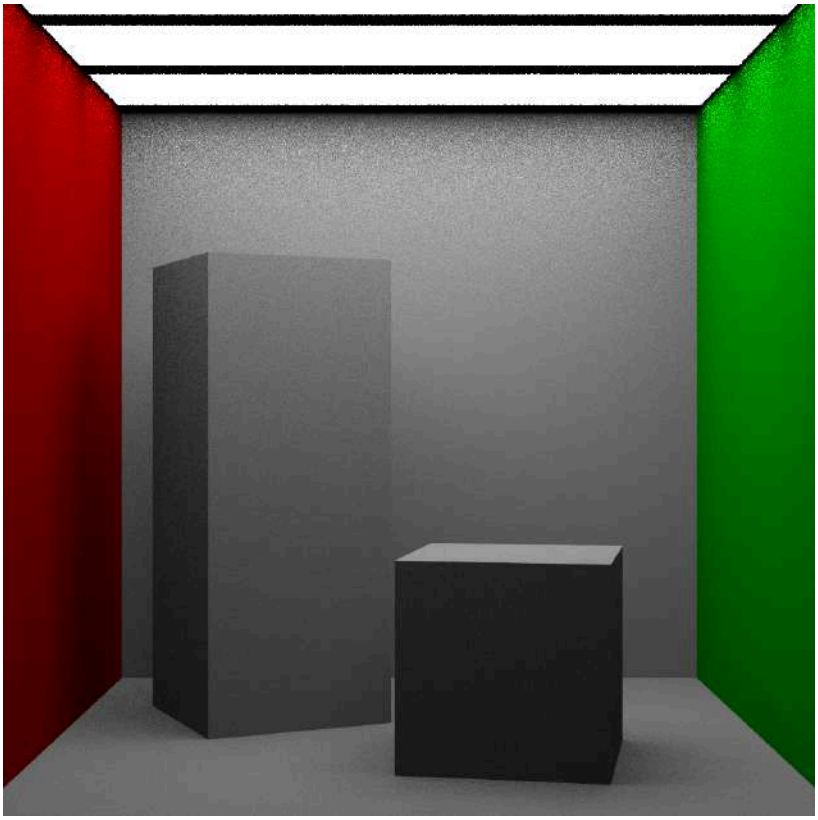


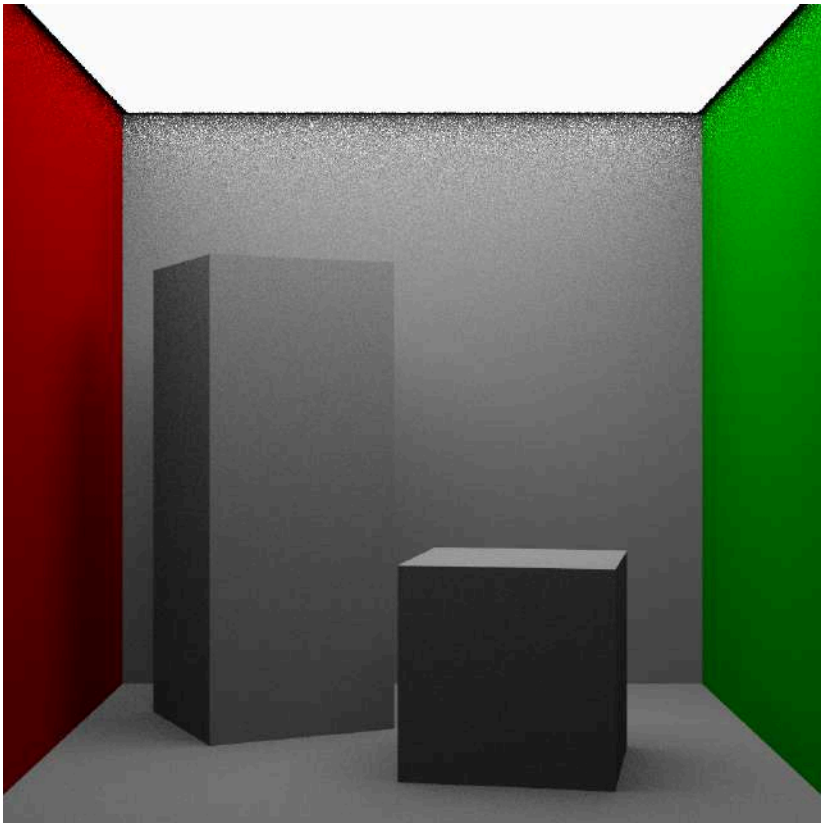


3.Light sampling:









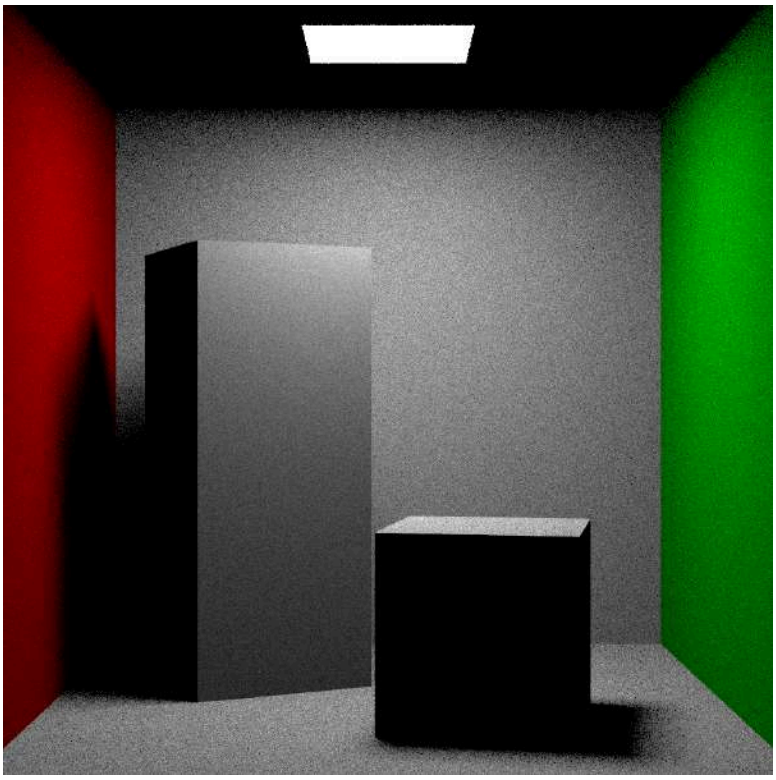
spp = 1000

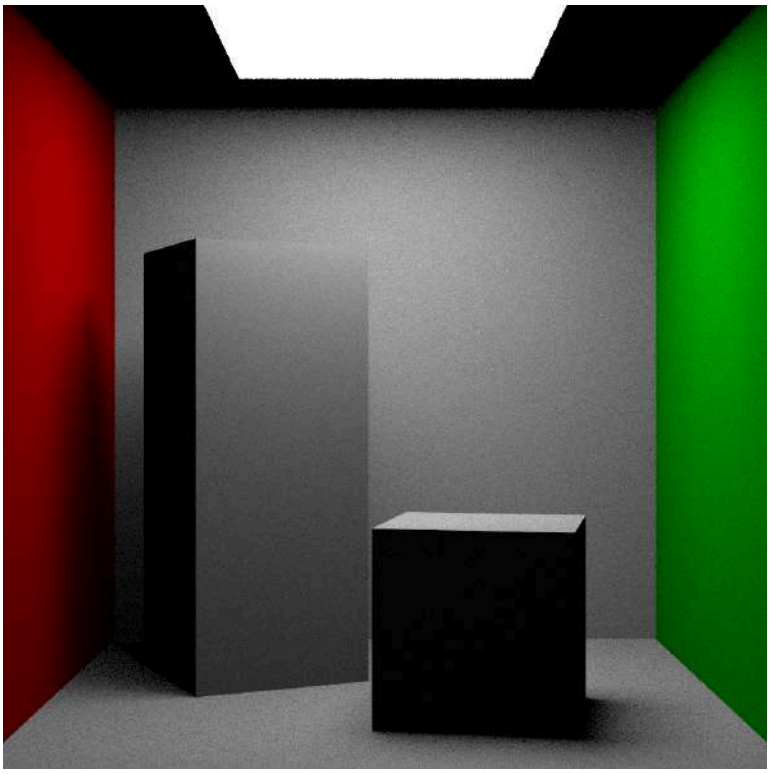
Rendering time :

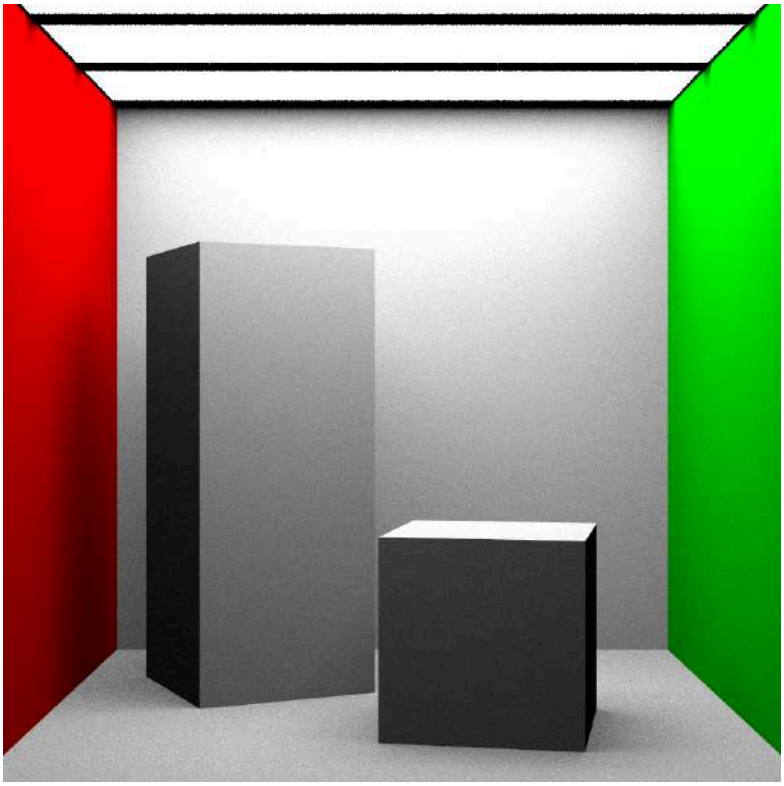
	Small light	Medium light	Many lights	Big light
Uniform hemisphere sampling	1167.1s	1130.1s	1292.5s	1371.7s
Cosine sampling	1135.3s	1148.9 s	1437 s	1297.7s
Light sampling	991.3s	983.2s	1108..2s	1307.5s

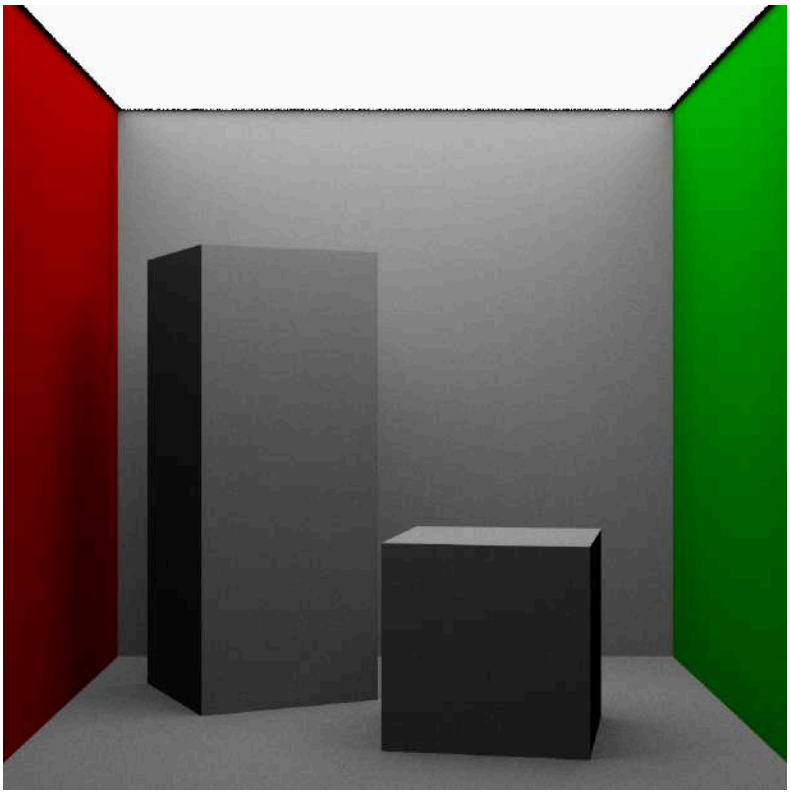
Rendered Images:

1.Uniform hemisphere sampling :

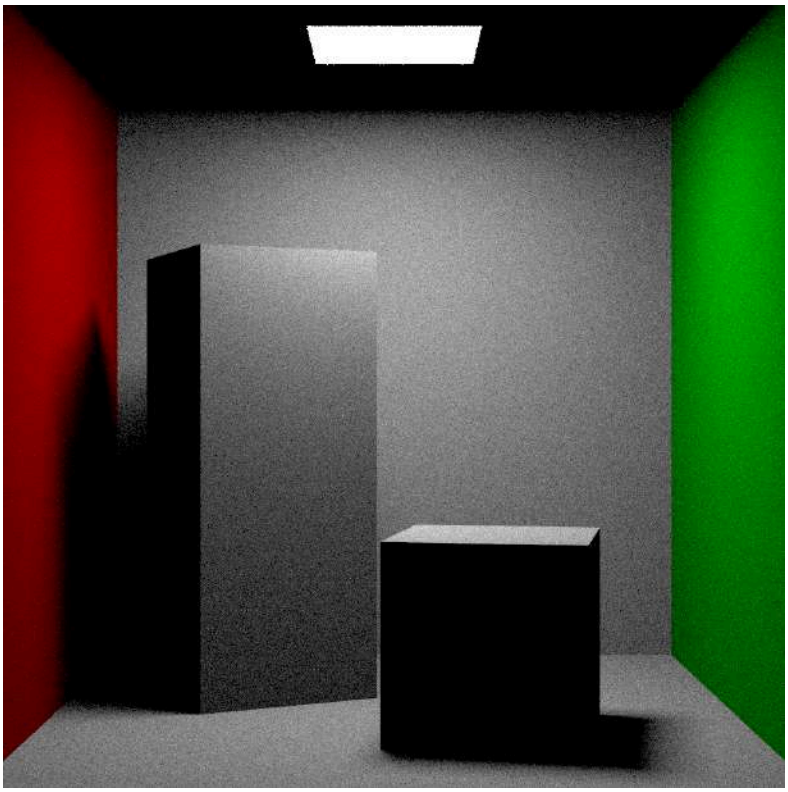


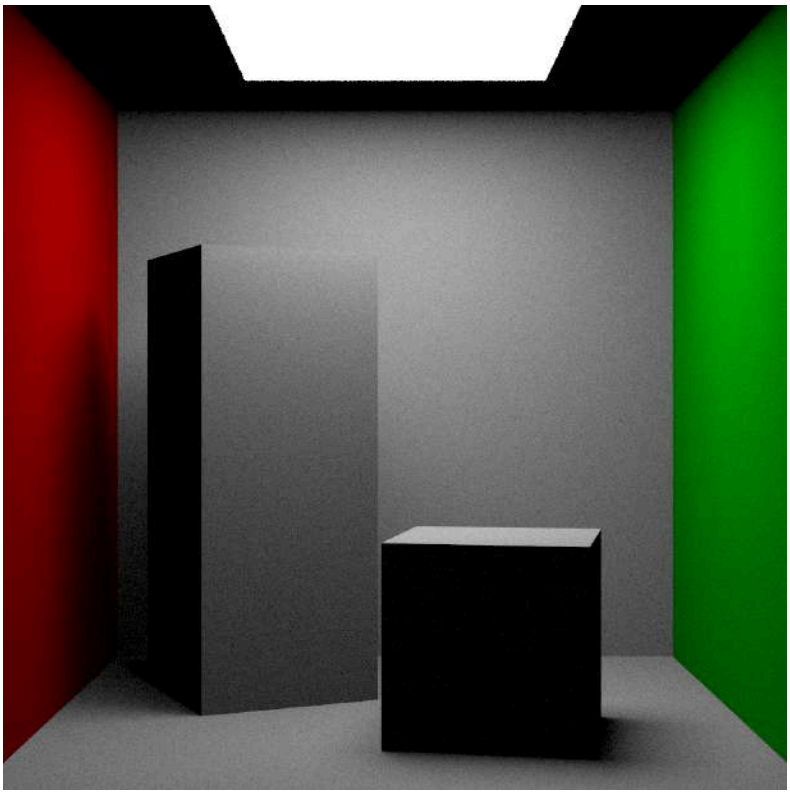


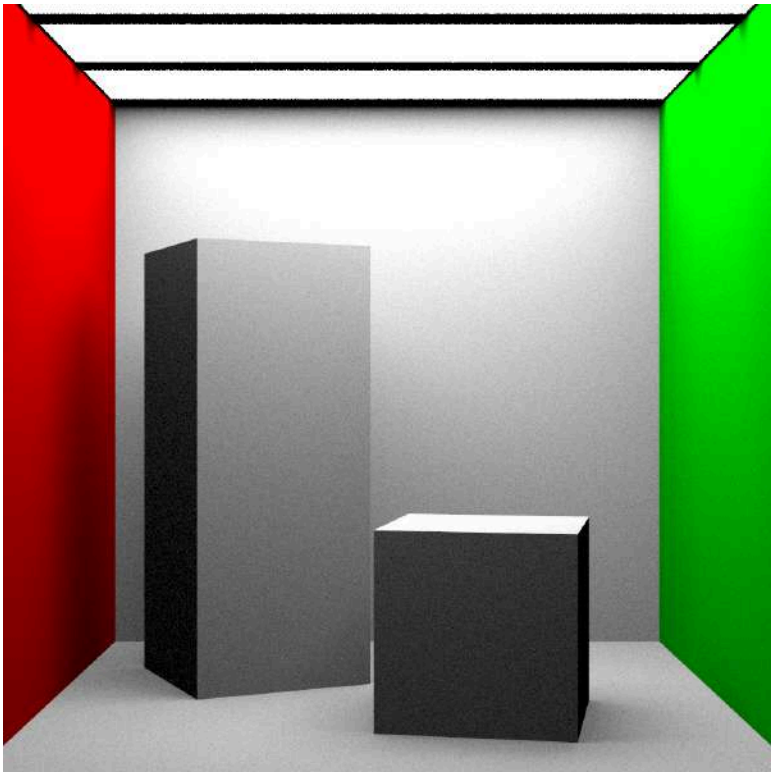


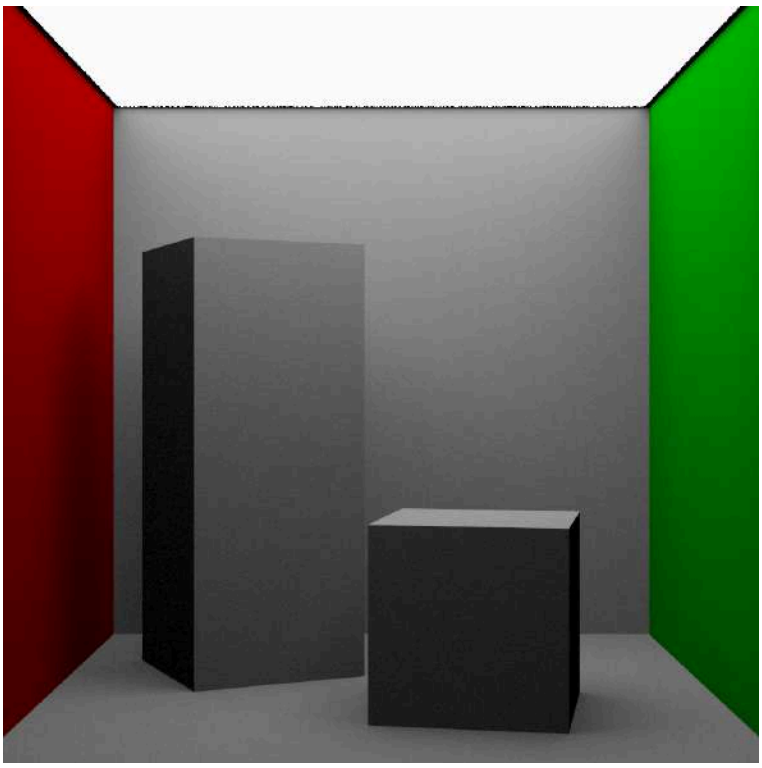
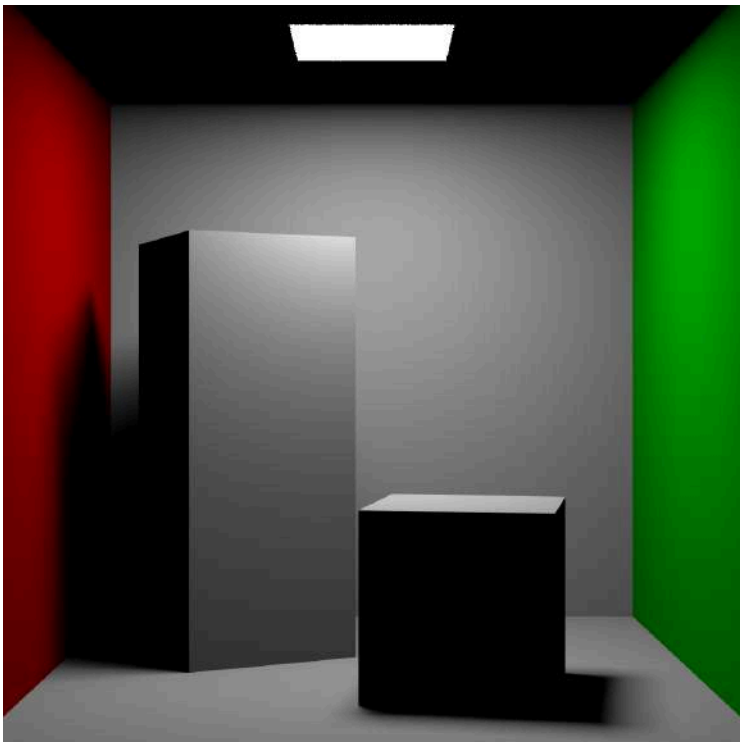
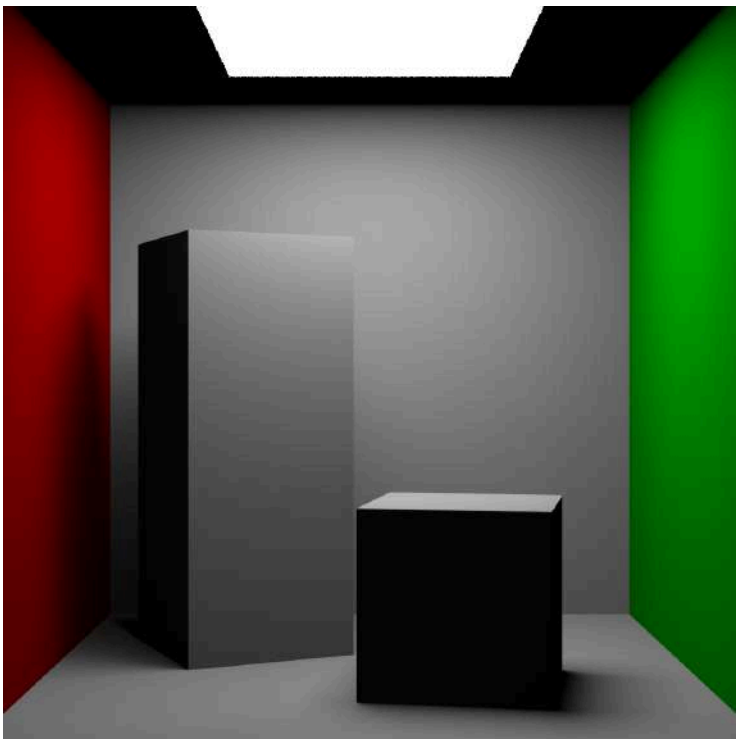
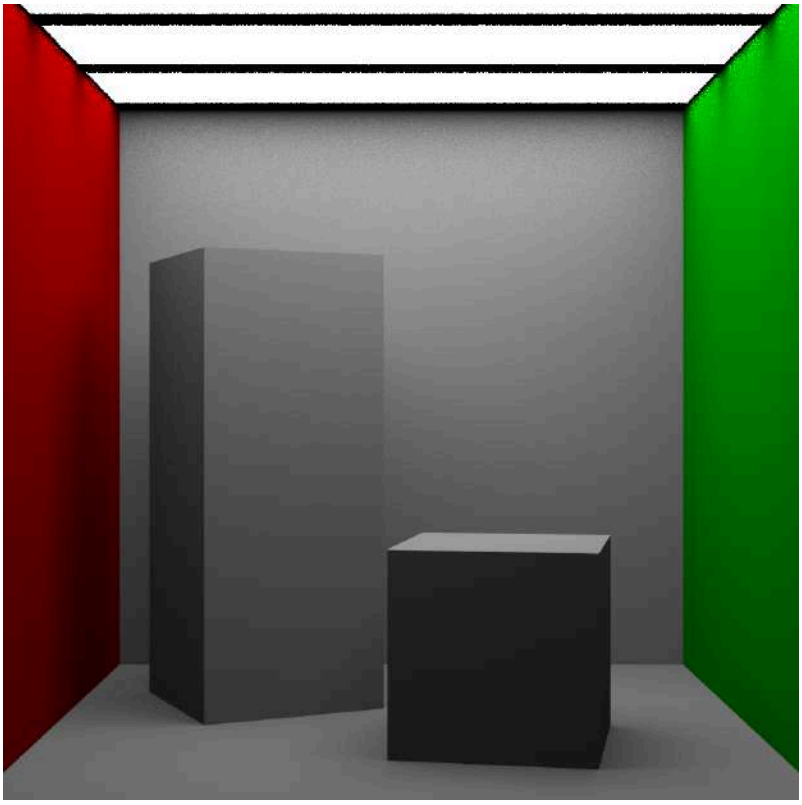
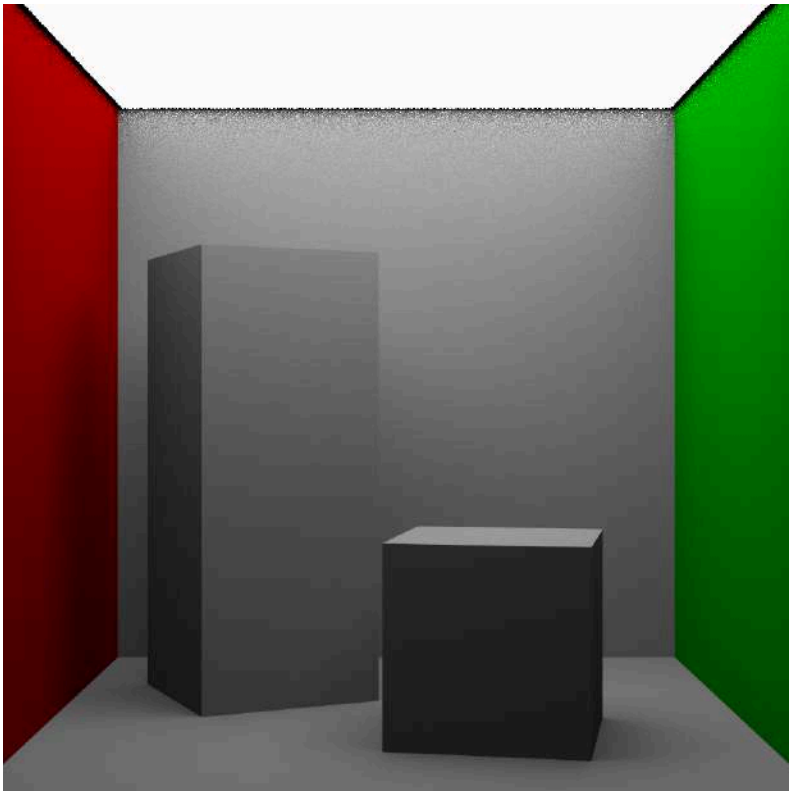


2.Cosine sampling:









3.Light sampling: