

Comp380

Programming Assignment #7

Due: June-10 (before 11:59pm)

Difficulty: easy

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Objective: Ray tracing method is another archetype of rendering techniques. It is very simple and elegant in its theoretical foundation, yet yields a superior photorealistic quality of rendered image. There are lots of frameworks that can assist you. Let's scratch the surface of such ray tracers by your hand, and see how it looks.

Requirements:

4) Modify the source code of the "pathtracer" so that the title of the window has your student ID and name. (10 pts)

Answer: 아래의 Figure 1, 2를 참고해주세요.

5) Question: Why is it slow? Justify your answers using your knowledge on ray tracing. (10 pts)

Answer:

- A. For global illumination, shading, depth-of-field, anti-aliasing ...etc., ray tracing technic needs many random samples per pixel.
- B. Although you use BV hierarchy or spatial subdivision method, it's really time-consuming process that checks ray-scene collision, whenever ray is generated. In fact, all triangles must be visited to build the hierarchy in the first step of ray tracing too.
- C. Hard to use data coherence to share computational information between pixels, unlike scanline or other algorithms.

6) Question: Why does it seem noisy at the beginning? Why does it change as time goes? (10 pts)

Answer: (참고: Embree는 Monte Carlo ray tracing기법을 이용한다.) ray tracing을 할 때 antialiasing등의 이유로, 픽셀마다 여러 번의 random sampling을 수행한다. 이 과정에서 얻어낸 많은 수의 ray를 tracing하여 각 ray에 대한 색을 얻어낸 뒤, 그것을 평균하여 해당 픽셀의 색으로 지정한다. 큰 수의 법칙에 의해, random sample의 개수가 커질수록 sample mean은 population mean (realistic color)에 수렴한다. 그러나 sample의 수가 적다면 잡음이라는 결과를 만들어낸다. 따라서 초기에는 sample의 수가 적어 이미지에 잡음이 있지만, 시간이 지날수록 sample수가 많아져 잡음이 점점 사라지고 이미지가 깨끗해진다.

7) Question: Can you pick up any kind of the visual effects which seems hard to implement with rasterization methods? (10 pts)

Answer: 오른쪽의 빨간 벽면에서 반사된 색이 위, 뒤, 아래 벽면의 색에도 영향을 주고 있다. 이런 효과는 global attribute들을 통해 얻어지는 것이므로, rasterization으로 구현하기 힘들 거로 생각한다. 물론 텍스처 매핑 등을 이용해서 인위적으로 만들 수는 있겠지만.

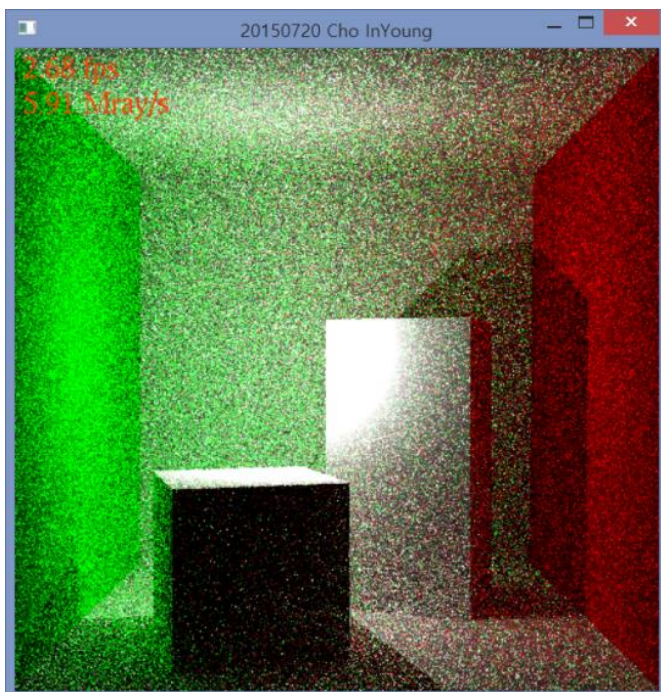


Figure 1: Req 4,6

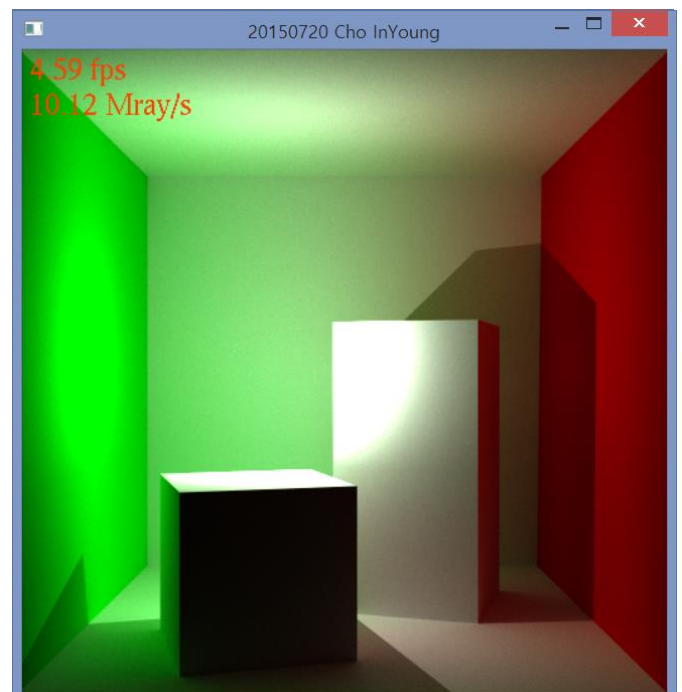


Figure 2: Req 4,6