

# Assignment 2

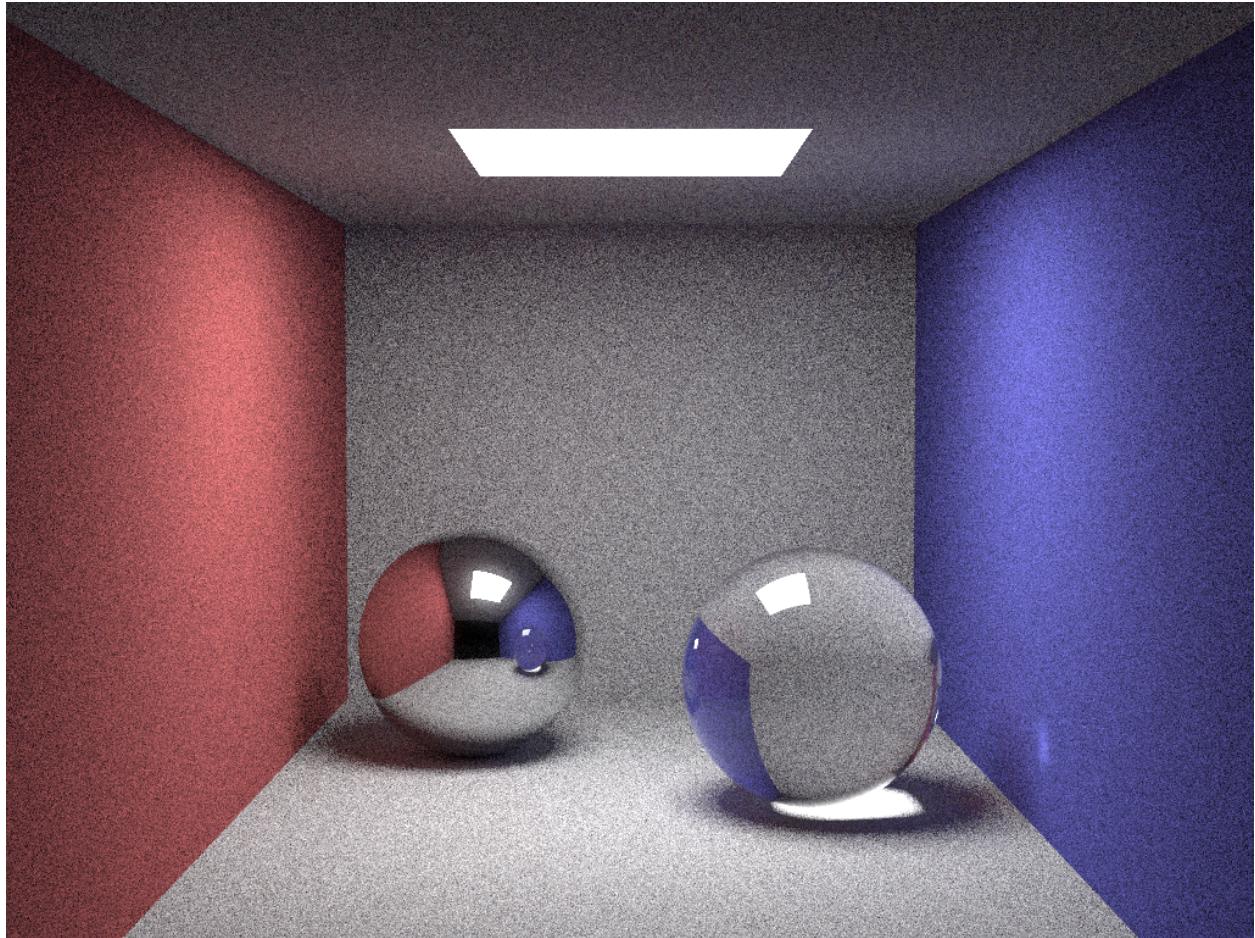
Team Member:

- 1) Chaitanya Katti - 210100044
- 2) Ritam Barai - 20d070064

## Part 2: Monte Carlo Path Tracer

### Renders<sup>1</sup>

- 1) Cornell Box

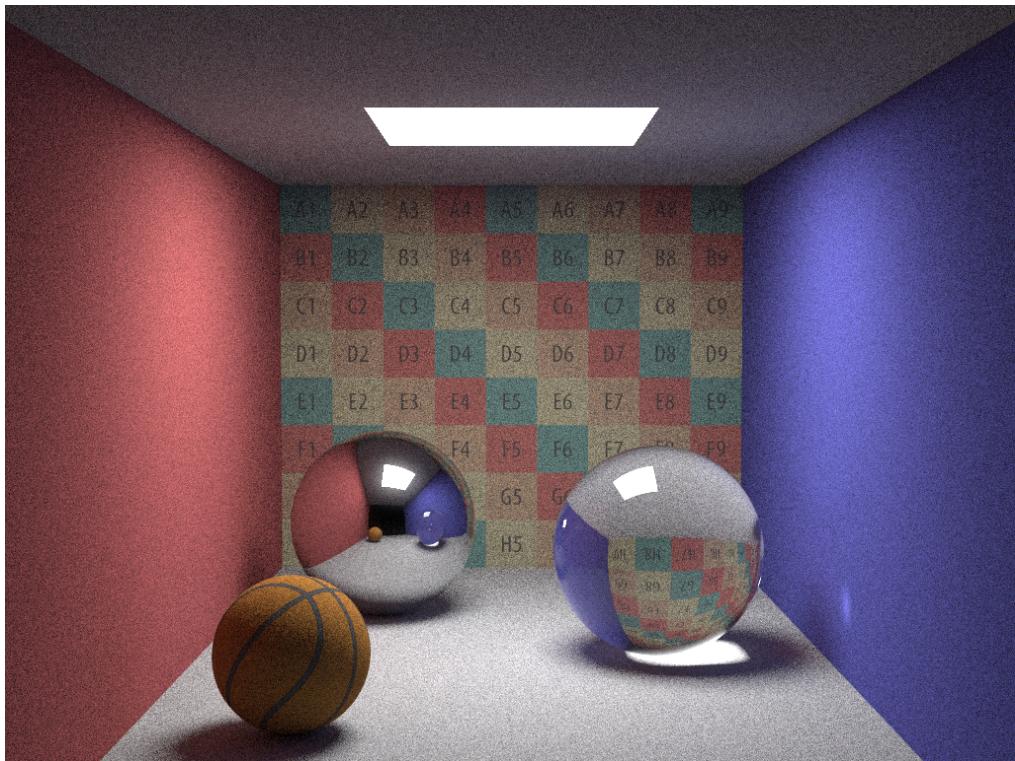


**Noticeable effects:** Fresnel reflections, refractions, soft shadows, colour bleeding(prominent in the shadows) and caustics.

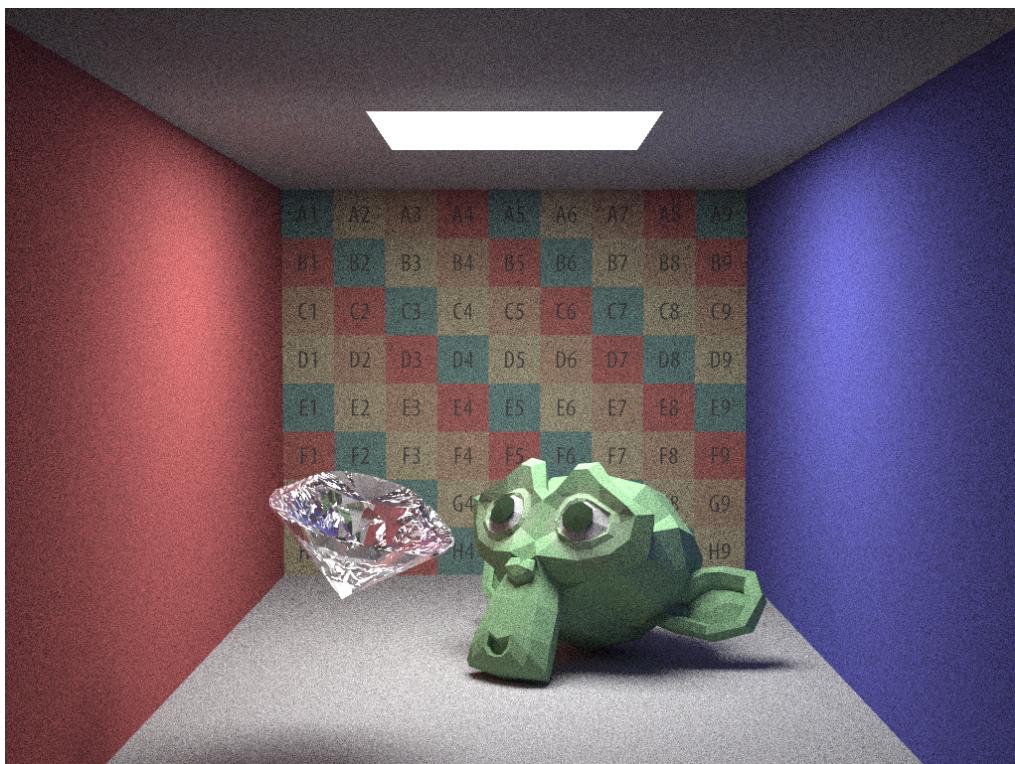
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<sup>1</sup> Color banding may appear due to image compression. Please take a look at the github [link](#)

## 2) Textured Surfaces



## 3) Total Internal Reflections



#### 4) More Emissive Materials



## Implementation

Simple recursive calls to the same function end up accumulating colour. The only source of illumination is emissive objects, hence coefficient  $K_e$  was added to the material class.

The following was the only function that needed to be implemented for path tracing.

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### Monte Carlo Path Tracing

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```
1: function RADIANCE(scn, ray, d)
2:   if d > depth then
3:     Return black color
4:   end if
5:   found_intersection  $\leftarrow$  False
6:   Initialize minhit
7:   for each object in scn do
8:     if Intersection found with object then
9:       Update minhit
10:      found_intersection  $\leftarrow$  True
11:    end if
12:   end for
13:   Initialize d_col to black color
14:   if found_intersection then
15:     Get normal, hit point, object, and material from minhit
16:     Compute cosine of angle between normal and incident ray
17:     Get diffuse color from material
18:     if Material emits light then
19:       Add emissive light to d_col
20:     end if
21:     if Material is reflective then
22:       Compute reflected ray direction
23:       Compute Fresnel term
24:       Add reflected radiance to d_col
25:     end if
26:     if Material is transparent then
27:       Compute refracted ray direction
28:       Compute Fresnel term
29:       Add refracted radiance to d_col
30:     end if
31:     if Material is neither reflective nor transparent then
32:       Sample new direction on cosine hemisphere
33:       Compute BRDF for diffuse and specular components
34:       Add radiance from sampled direction to d_col (Recursive Call)
35:     end if
36:   else
37:     Set d_col to background color from scene
38:   end if
39:   Return d_col
40: end function
```

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