Menglong shi

Description of the picture below the NUMDIV is reduced to 300

P1. The scene without anti-analising and fog.

P2. The scene with anti-analising and without fog

P3. The scene with anti-analising and fog.

P4. The scene with anti-analising,and without fog, cap of the cylinder

First Part (basic ray tracer marks:10)

1. A good and meaningful spatial arrangement.
2. One transparent sphere in front of the cylinder
3. All objects have shadows.
4. The box around the scene is made up of planes.
5. The floor and table have chequered patterns.

The second part (extension marks:7)

1. Objects have a sphere, plane, cylinder, or cone. (2 more obj)
2. Refraction by the middle of the sphere with eta 1.5
3. Two light sources, which cause different shadows and 2 specular highlights
4. Adaptive anti-aliasing (show below the First one without it, the second one with it) , compare with the 10% of the mean, and has largerest difference with mean.
5. Non-planar obj texture, the sphere on the cone.
6. Fog showed in the third picture.
7. The cylinder with a cap. Without cap pictrue4.

Technique used:

1. For a cylinder, the intersection equation is used, and the cap of it which determent by if one of the intersection points high value is greater than yc+h and another is below that point then the intersection should be set at the top cap. Well, I didn't implement the bottom cap as it is hard to see, the return intersection to yc and the condition is if the intersection point is less than yc.

2. Same for cone, but work the equation by hand. And also note7.
3. Refraction follow by lection note
4. Two lights use note7, but I add the coefficient to both diffuse and specular terms to press the brightness. And shawods condition also learn from here.
5. Adaptive Anti-anlising is makes it more smooth as it takes average color values of one pixel wchich has 4 ray, if one of it has significant difference it will generate 4 ray again for that grid.
6. Sphere textrue, learn from web,
u = 0.5 + arctan2(dz, dx) / (2*pi)
v = 0.5 - arcsin(dy) / pi
7. Fog, learn from the note, use linearly blend, if the object in the range of t1 and t2, then its color will be color = (1-t) color + t white. Range -80, -200 for z1 and z2, which are behind most the obj.

Time take:

With anti-analising, it takes around 9s, without it 4s.

Run:

cmake CmakeLists.txt
Make
./RayTracer.out

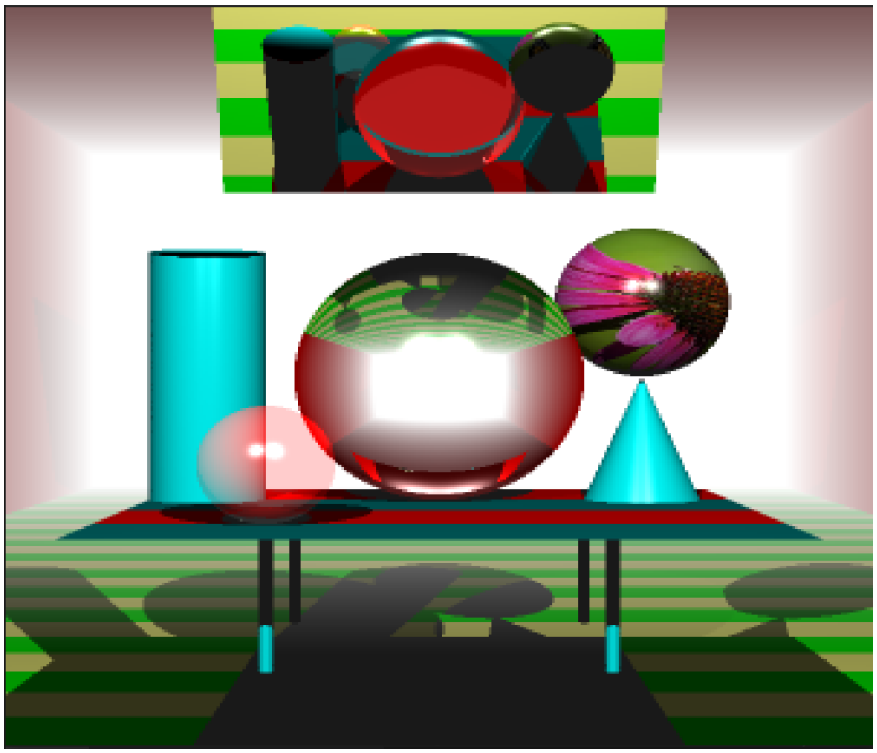
Reference:

https://stackoverflow.com/questions/22420778/texture-mapping-in-a-ray-tracing-for-sphere-in-c
https://learn.canterbury.ac.nz/pluginfile.php/4143108/mod_resource/content/29/Lectures/Lec08_RayTracing.pdf
https://learn.canterbury.ac.nz/pluginfile.php/4143109/mod_resource/content/22/Lectures/Note07_RayTracing.pdf

P1

P2

P3



p4