CS148 Final Project Write-up

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Motivation and Description

Here are our reference images:
We wanted to create a drunken, abandoned, half-played billiard game scene in a dimly lit, rundown bar. This is why some of the balls are neatly arranged in the ball rack while some of the balls are scattered all over the billiard table. To generate a "drunken" feeling to the scene, we also added an unopened bottle of alcohol on the table and an empty bottle of alcohol lying horizontally on the billiard table.

The setting of the scene shows the perspective of someone discovering the abandoned billiard table in the rundown bar.

We added the depth of field effect to make the overall scene look more artistic. We also adjusted the reflectivity, refraction and transmittance carefully to make the bottles of alcohol look more realistic. Since the bottle lying horizontally on the billiard table is empty, we made sure that the rendering of the bottle looks like one can "see through" the bottle to see the texture of the pool table cloth surface. Since the unopened upright bottle is filled with liquid in it, we made sure that it looks like it refracts the billiard sticks behind it in a realistic and natural manner.

We also made sure that the billiard balls were sufficiently reflective (reflectivity parameter = 0.1) that these billiard balls reflected our background scene and the surrounding billiard balls. The background was built using a skybox layered with images we carefully picked out for proper reflection onto pool balls and to set the overall mood of our scene (dark and dreary).

**Assets**

**Models**

- Billiard Chalk and background cuboid was modelled by us.
- Billiard table, billiard stick, billiard balls, billiard ball rack, alcohol bottle and bottle cap were found from online resources.

**Textures**

- Billiard Chalk texture was modelled by us.
- Textures for the billiard table, billiard table cloth surface, billiard stick, billiard balls, billiard ball rack and alcohol bottle cap were found from online resources.
- We used both online images and our own work to generate the texture for the skybox.

**Lighting, Layout and Camera Perspective**
We added area lights on top of the scene to generate realistic looking soft shadows. We did not use point lights since that led to hard shadows which we want to avoid in our scene to make sure that our rendered scene looks as realistic and natural as possible.

We added a good variety of objects in our entire scene in a rather messy manner to let the viewer feel that this billiard game was abandoned.

We also adjusted our camera perspective to be diagonal across the billiard table so that we can capture all of our objects on the billiard table as much as possible.

Technical Contributions

1. **Depth of field** was implemented in PerspectiveCamera.cpp so that the objects further away from our camera’s viewpoint will be blurred out. We decided to use the billiard chalk, some of the billiard balls and the upright, unopened alcohol bottle as the focal point of our scene. This enables us to blur out the other objects further away from our camera’s viewpoint. The radius of the camera lens was 0.01 and the distance to the focal plane is 0.8.

2. We modified the reflectivity (value = 0.2) and transmittance (value = 0.8) parameters for the glass bottle objects so that we can make the horizontal bottle have a “see through” effect while the unopened vertical bottle with liquid refracts the billiard sticks behind it in a realistic and natural manner.

Files We Modified

Assignment7.cpp -- loaded own scene, set reflectivity / transmissivity values, added lights
PerspectiveCamera.h/cpp -- depth of field
MeshLoader.cpp -- comment out of aiProcess_FixIn-facingNormals flag
RayTracer.cpp -- use our camera
Work Breakdown

**Gao Xian Peh:** Lighting, project set-up, chalk modelling in Blender, refraction and reflection off objects, depth of field effect.

**Tony Lee:** UV mapping of background, skybox, UV mapping of chalk, design and texture adjustments.

**Both:** Scene theme, scene layout, model-searching, lighting, camera arrangement, texture selection and application and endless tweaking and re-rendering.

References

3D Models:
- Billiard Table and other billiard assets [link to BlenderMarket Product]
- Alcohol Bottles [link to TurboSquid product]

Textures:
- Billiard table, billiard table cloth, billiard ball rack, [link to Poliigon]
- Metal alcohol bottle cap texture [link to FreeCreatives]
- Image textures used for the skybox [link to Textures]
- Background texture [link to Image Source]