Coursework 1: Reel or Real?

Figure 1a: Real World Photography

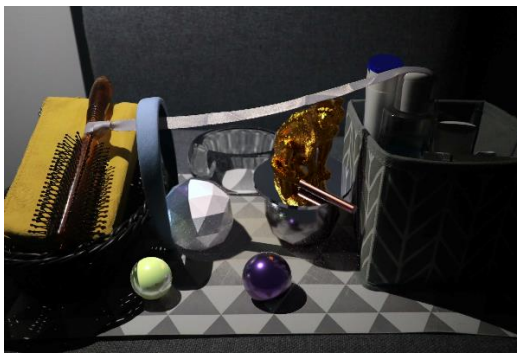

Figure 1b: Output with Virtual Objects

1. Planning the scene

   For making an interesting and complex real word image(Fig. 1a). First, I used a basket which had a lot of small holes to refract the light and put a small yellow bag and a hairbrush in it. Then, placing a headband beside the basket to have a difficult angle for refraction. I planned to set up virtual objects in the middle so that the objects could had the reflection surrounding. A ribbon which was designed to project a shadow on virtual object was displaced on top of them. Moreover, to make different textures I put a cutting board underneath and a box on the right side so that they could appear on the rendered objects.

   For virtual objects, I chose a green plastic ball and a white plastic Polyhedron to reflect basket, headband and ribbon shadow. A purple metal and a black metal were designed to reflect the shininess specular light and virtual objects. I also selected a mirror for 3D model lion and a metal cylinder. Last, there was a glass torus in the back for reflect texture and the background.

2. Modelling the scene

   I used Blender to build the scene and placed the materials in it. Fig. 2 is the scene and the virtual objects that I made from the virtual camera.

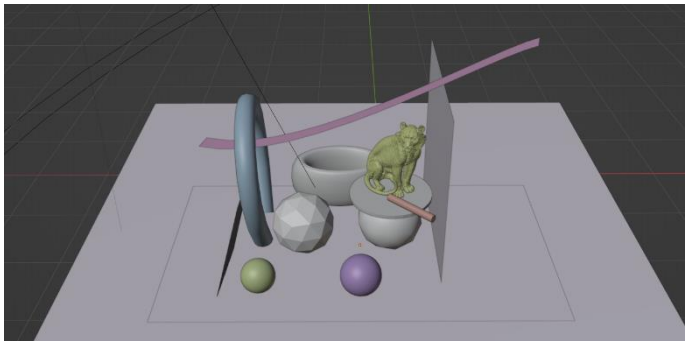

Figure 2: Blender view from the camera

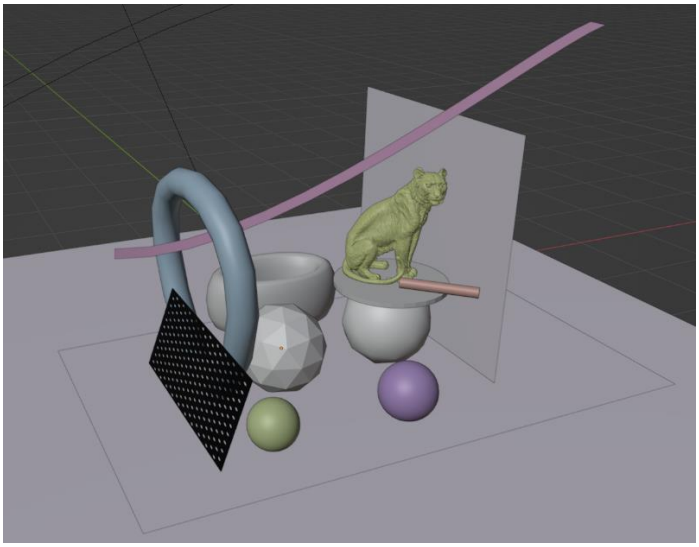

Figure 3: Closer view in Blender

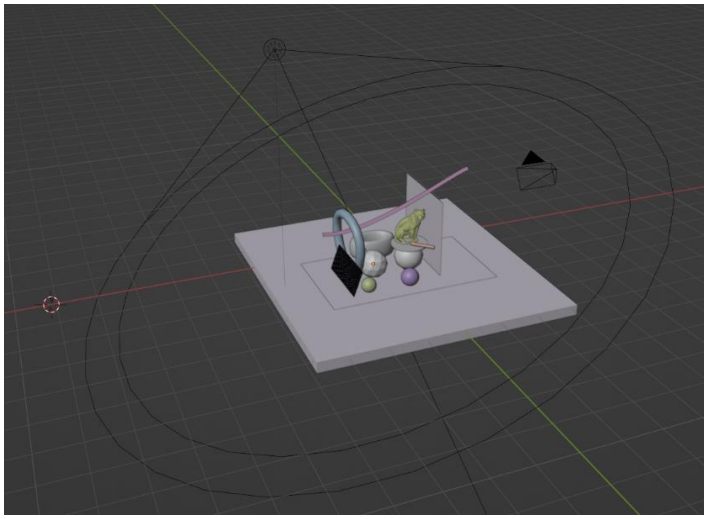

Figure 4: Whole view in Blender

Fig. 3 and Fig. 4 are some views in Blender. I put three planes in the scene to build the proxy models and the texture are in Fig. 5.

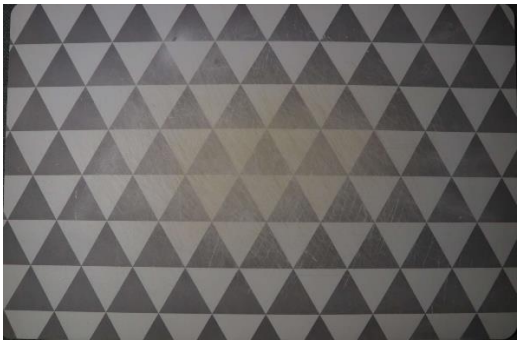

Figure 5 : Texture Images

As you can see, there is a black object that is at the bottom left in Fig. 3. I used the method called Face Tools and subdivide to help me generate the plane. The pink line and the blue curve were generated by Bézier Curve. After drawing, the curve needs to convert to mesh so that it can be seen in the PBRT file. I add a dark grey background in PBRT file.`LightSource "infinite" "rgb L" [.02 .02 .02]` to light up a little bit for mirror. Then, generated PBRT file by PBRT exporter and rendered with it.

3. Rendering the scene

   Fig. 7 is what I adjust the light in Luminance HDR and Fig. 8 is the final editing in Gimp editor which generated photorealistic scene. I used Fattal as the implementation of tone mapping operator and set the parameters as Fig. 6:

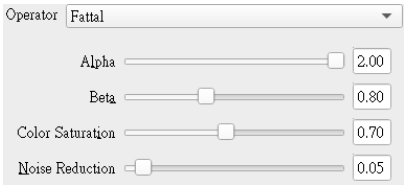

Figure 6: Parameters for the output view in Luminance HDR

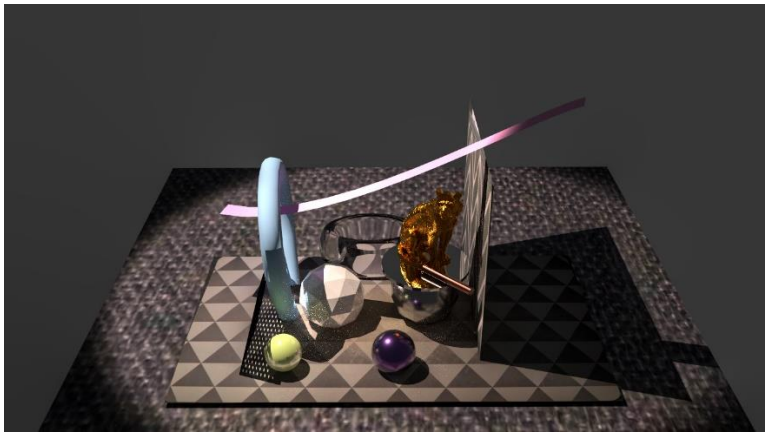

Figure 7: Rendering View with HDR

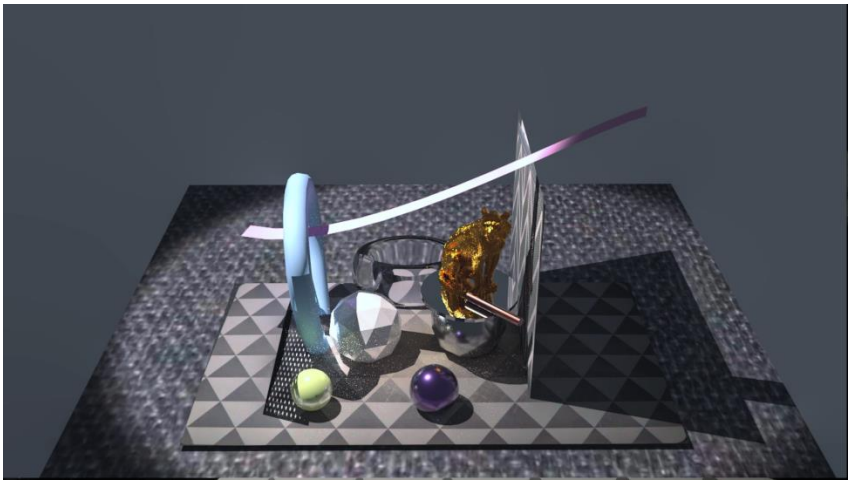

Figure 8: Rendering View with HDR + Gimp

4. Compositing the scene

   I used Gimp editor to combine real photography with virtual objects. Fig. 9 is the zoom-in view of the integrated scene which I'll explain more detail.

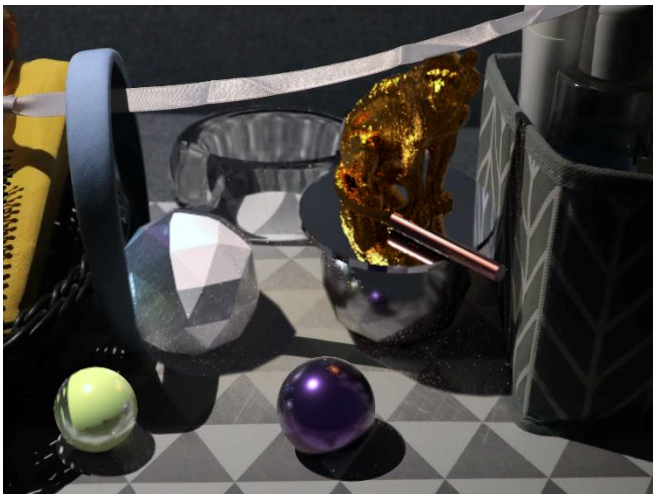

Figure 9: Integrated view

(a) The Green Plastic Ball: The ball got the shadow of the basket from the left-hand side, the reflection of the texture at the bottom and the specular reflection on the top. There was a small spot that reflect golden lion and purple ball on the right-hand side as well. For the reflection of the texture on the floor does not looks quite smooth.

(b) The Purple Metal Ball: The metal ball had the reflection of the bottom texture, the blue headband on the left and virtual objects (green ball, white polyhedron and golden lion). The specular reflection also could be seen in the top-left side. I think it generate very well on it.

(c) The While plastic Polyhedron: The polyhedron had the shadow of the headband and ribbon. However, it had a lot of noise on it. I tried to render the sample per pixel up to 1000. It did not reduce the noise.

(d) The Glass Torus: It reflected the texture at the bottom and the background color. However, when I what to render it close to real world. It seems a little bit weird.

(e) 3D object – Golden lion (.ply file): It was placed underneath the ribbon which we could only see one ear and it was a diffuse reflection which reflected the yellow and absorbed blue color. The body of the lion also had some reflect from the mirror and the shadow was on the texture on the right-hand side. The shadow on the lion is actually really nice.

(f) The Red metal Cylinder: The shadow of it was placed on the texture on the left and the metal polyhedron below. The reflection of the cylinder was on the mirror. At first, the color on the metal is dark. I tried a lot of different angle to get the correct light illustration.

(g) Mirror: It was set on a metal polyhedron. It was a specular reflection so it reflected lion and the red cylinder. Moreover, the texture on the right was also illuminated on the surface and the environment background. I used lighter background so that the mirror won't look too dark.

(h) The metal polyhedron: It reflected the rendered objects, texture objects and the environment background on the surface. This is actually really nice but only thing is that I did not set any environment for the area near the camera. There was a small space that is just dark grey.

The last thing is that the shadow of all rendered objects are placed in the real world.

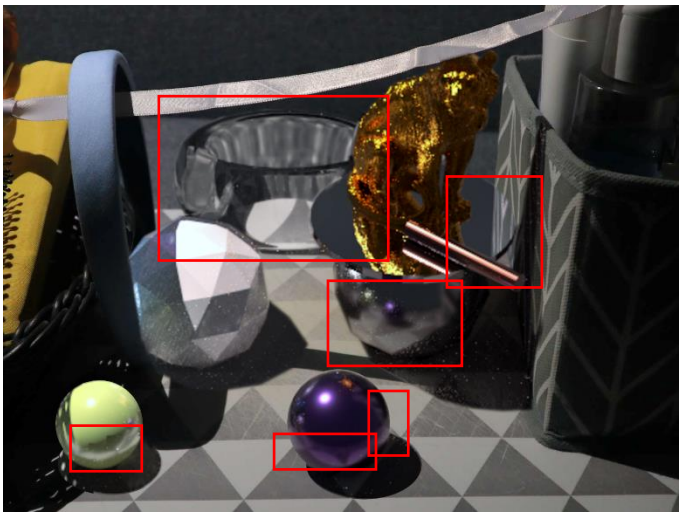

Figure 9a: Real objects' reflection

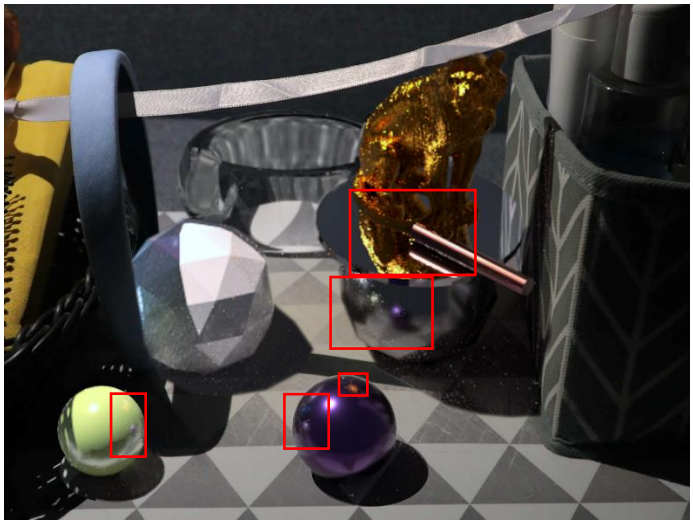

Figure 9b: Virtual objects' reflection

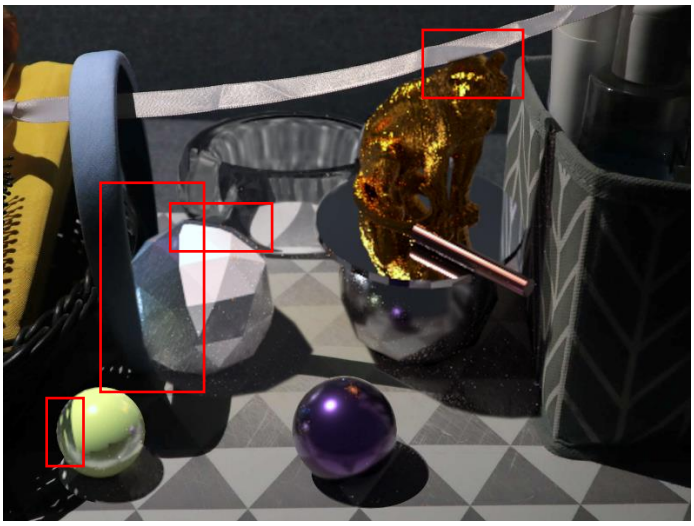

Figure 9c: Real objects' shadow on virtual objects

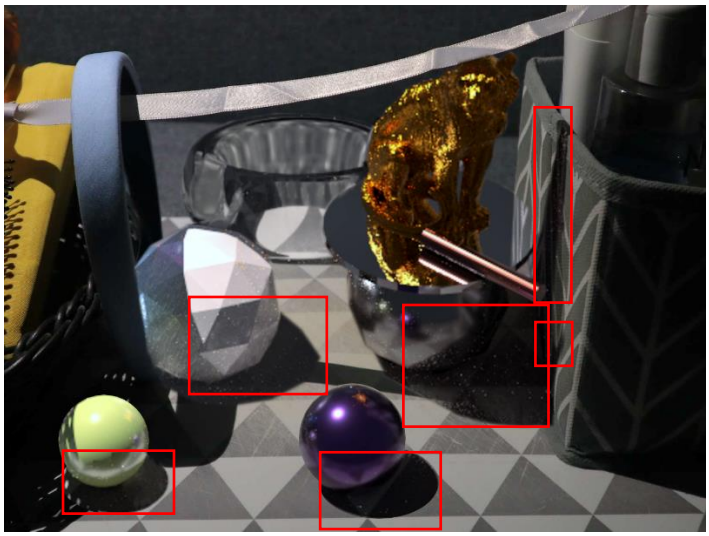

Figure 9d: Vertical objects' shadow on Real objects

Figure 9e: Reflection of vertical objects' shadow

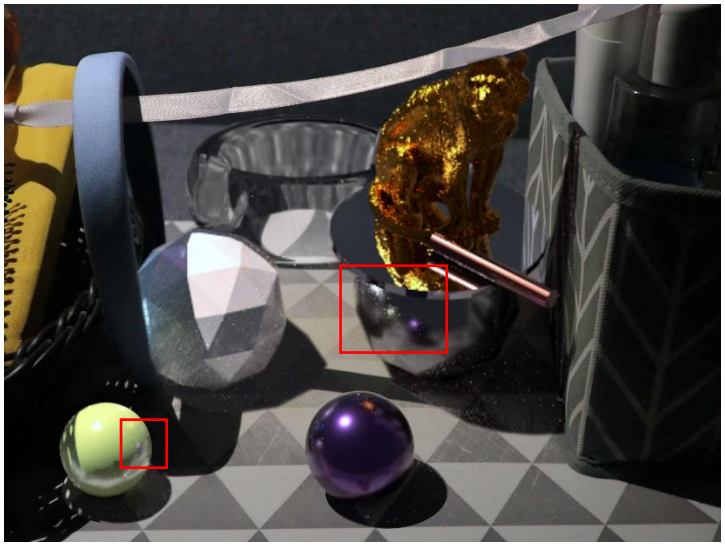

Figure 9f: Reflection between rendered objects

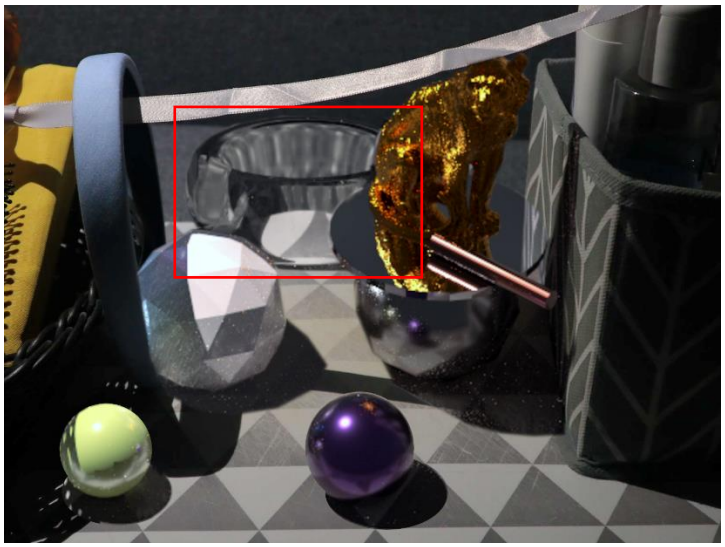

Figure 9g: Translucency

As we can see from Fig. 9a ~ Fig. 9e are the reflection and shadow from real or virtual objects. In addition, I tried to render some customization like Fig. 9f and Fig. 9g. The final composited image is showed in Fig. 1b.