CS 551 Write-Up Assignment#4

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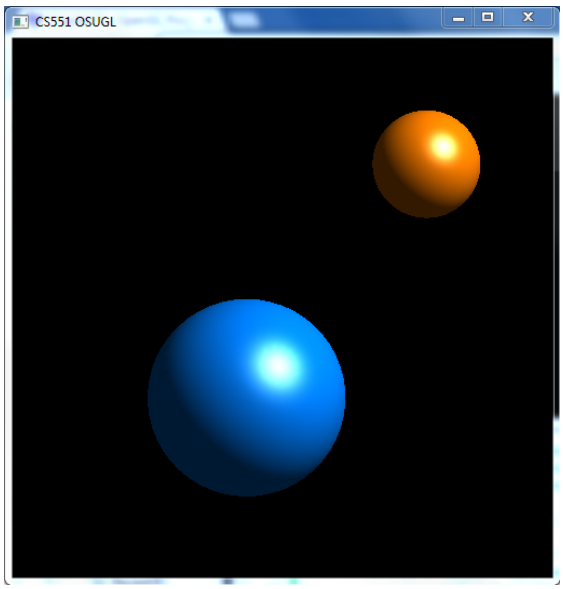
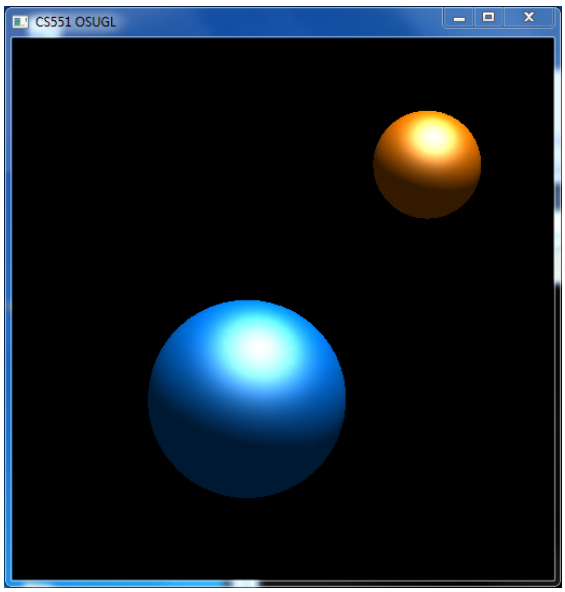
1. A discussion of the difficulties that you have encountered in this assignment.

   There are still a lot of difficulties that I have faced in this assignment, even though this is the last one. In my opinion, this is not only the last assignment, but also the most difficult one. Unlike previous assignments, the professor provided us nothing to work with. This is the first problem I had.

   In the past three assignments, we always have something that can be used as references provided by the professor. However, we need to create our solution from nothing this time. This really gives me a challenge. I used to have no knowledge of OpenGL, even though by taking this class I gain some experience, but I don't think it's enough for me to write the whole program. I also had nobody to talk in doing this assignment, so I can only handle this assignment by myself. The solution I create this time is based on my own understanding of the requirements of the homework, so it is pretty rough. Fortunately, after searching online, I am able to do the illuminating things right based on the "gl" functions. The two pictures shown below are from the little program I wrote using those functions. By changing the light position and other values such as specular coefficient, the picture changes in the way I want.





   These pictures really give me an example that what my own pictures should be looked like. In the past assignments, these example pictures used to be provided by the professor. Then I start to implement the functions by myself. This is the second

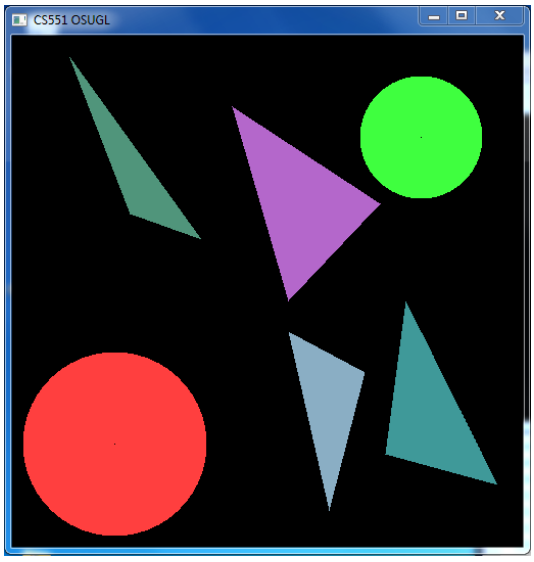
and the biggest problem I have met in this assignment.

Since I have nobody to talk about, I can only figure the algorithm out by myself. The only reference that I can rely on is the Internet. Based on the requirements of the assignment, we are going to implement lighting using “Phong illumination model”. So I searched online to see how to implement it. Fortunately, I find some source that talked about it and also provides the equations. The equations are shown below on the left.

$$Ir = ArKaDr + AttLr\,[KdDr(N \cdot L) + KsSr(R \cdot V)^n]$$
$$Ig = AgKaDg + AttLg\,[KdDg(N \cdot L) + KsSg(R \cdot V)^n]$$
$$Ib = AbKaDb + AttLb\,[KdDb(N \cdot L) + KsSb(R \cdot V)^n]$$

Ix = result color
Lx = light color
Ax = ambient color
Dx = diffuse color
Sx = specular color
Ka = ambient coefficient
Kd = diffuse coefficient
Ks = specular coefficient
Att = attenuation coefficient
n = usually referred to as "shine" or "roughness"
N = surface normal
L = light vector
R = reflection vector
V = view vector

These are the equations that I relied on to implement my program, and the meaning of variables in them are shown on the right. Based on what I have written in previous assignments, I implement equations and get my code works. However, I am not really sure how to calculate some of those variables, so I simply set them manually and test the result first. According to the requirements of the homework, I was intended to draw two spheres and four triangles in the same picture. The result I get by setting everything in static value is shown below.



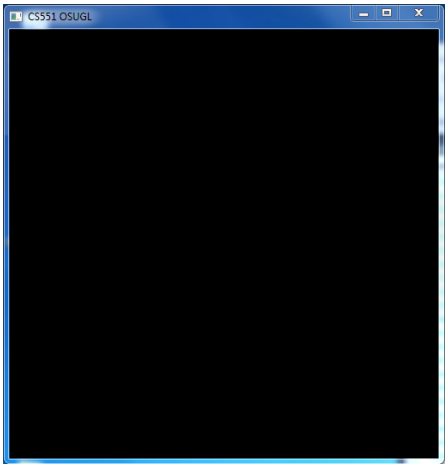
As we can see in the picture, there are no light exists in the picture. So that those two spheres are like 2D circles but not 3D objects. Then I realized that the problem is I

set every light vector and view vector with the same value. So that they have the same color and can show no difference. So I start to do the vector calculation part. Unfortunately, this is the third problem I have met, and it is still remains in the code. I don't have time to fix it correctly. Actually, after I changed the vector part, I can always get a whole black picture. Since I am running out of time, I decide to leave it on the code and see if I can fix it in the future days.

However, by manually changing the ambient color, diffuse color, and specular color, the colors I have in the picture are different, those differently colored objects in the previous picture can prove that.

2. A discussion of possible enhancement of your program.

   There surely are some possible enhancements in my program. The biggest thing is the function itself. Since after I change the code to calculate the vectors by itself, the result turns out a whole black picture like shown below. I changed the code back to the situation that every vector should be set manually in static value.



   This program is incomplete but it can run and at least show something. This is the biggest part that should be improved in the future. If I can fix it in a few days I will submit it again.

   There is another thing that can be improved in my code. Since I have nothing provided to work with. I simply throw a lot functions that I wrote in previous assignments into this one. A lot of them are not used in the code but they are just left in the file. And I also left a lot comments in the file. They can be removed to implement the code into a simpler and readable one.

3. Summary

Just like the problems I had in the previous assignments. I always struggled with the time and the lacking of experience. The good news is I finally learnt a lot in the class and some old problems do not exist now, such as compiling problems. However I also find that the knowledge taught in the class and should be used in the assignments is kind of difficult for me. They really take a lot of time of mine to get familiar with them. Also in the assignment, I submit an unfinished assignment again because I cannot finish them on time. Hope I can improve it in a few days later.