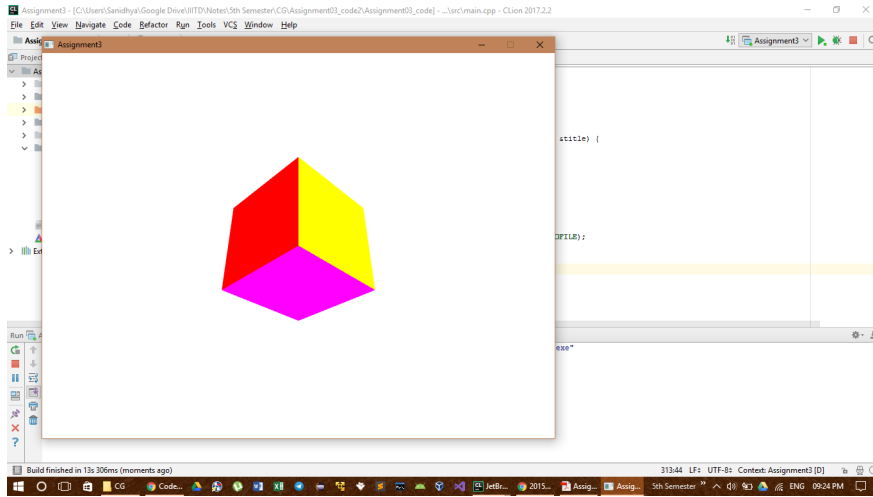# Assignment 3: Lightning and Shading

SANIDHYA SINGAL, Indraprastha Institute of Information Technology Delhi

Initial Run:

ANS 1

Ans (a)

The point light source was added to the program by adding two uniforms `vLightPosition` and `vLightColor` in the vertex shader. The required values were passed from the C++ code. The light source emits white light.

Ans (b)

The parametric equation of the sphere [1] is given by:

$$x = R \cdot cos\theta \cdot sin\phi$$
$$y = R \cdot sin\theta \cdot sin\phi$$
$$z = R \cdot cos\phi$$

where $\phi \in [0, \pi]$, $\theta \in [0, 2\pi]$

The sphere is drawn by method similar to that used to draw torus in the previous assignment. The normals are calculated by subtracting the vertices from the center of the sphere and then normalizing them. The sphere is supposed to be centered at origin. The required values have been passed to the shaders.
Following is the screen-shot of the sphere hence drawn:
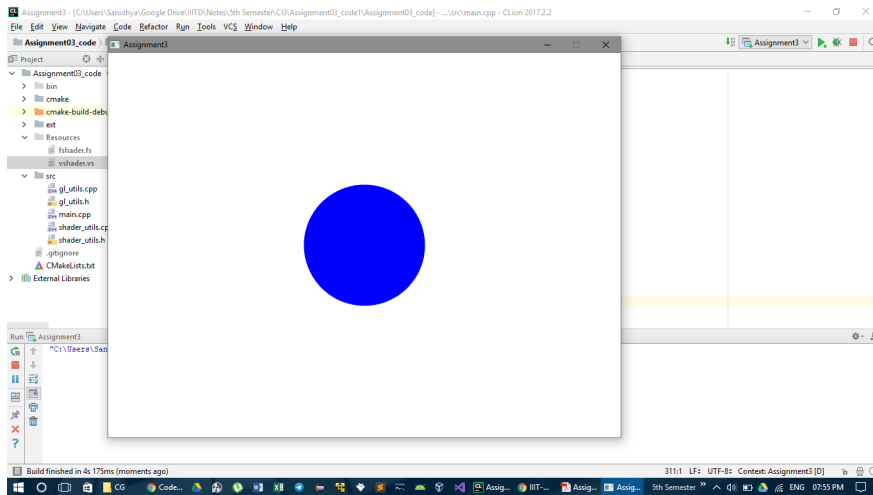
Ans (c)

This part involves adding the ambient and diffuse components in the vertex shader. The value of constants have been taken to 0.2 and 0.5 for ambient and diffuse respectively. Applying the formulae taught in class yields the following:
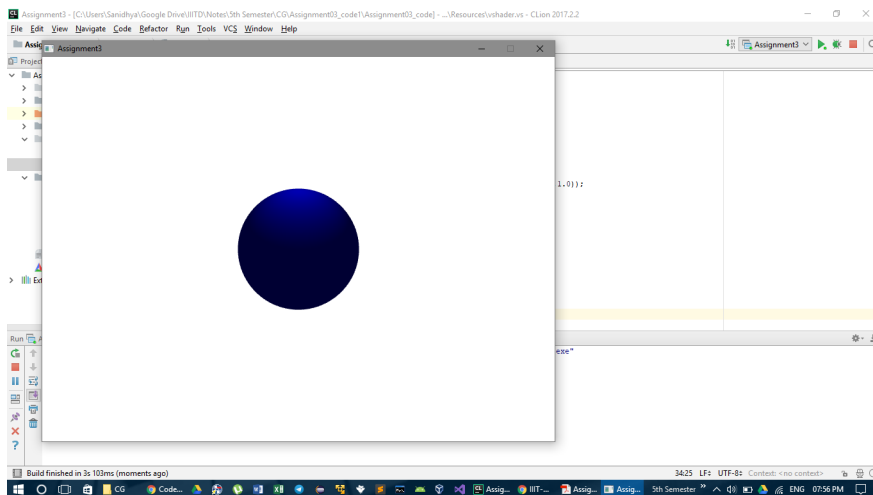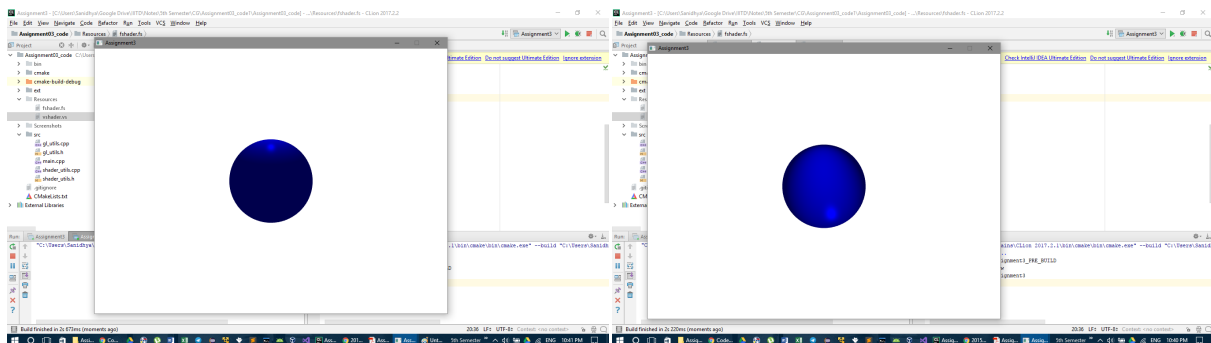

ANS 2

Phong shading involves changes in vertex shader. The known formulae are applied after passing all the values needed. Following are the screenshots:
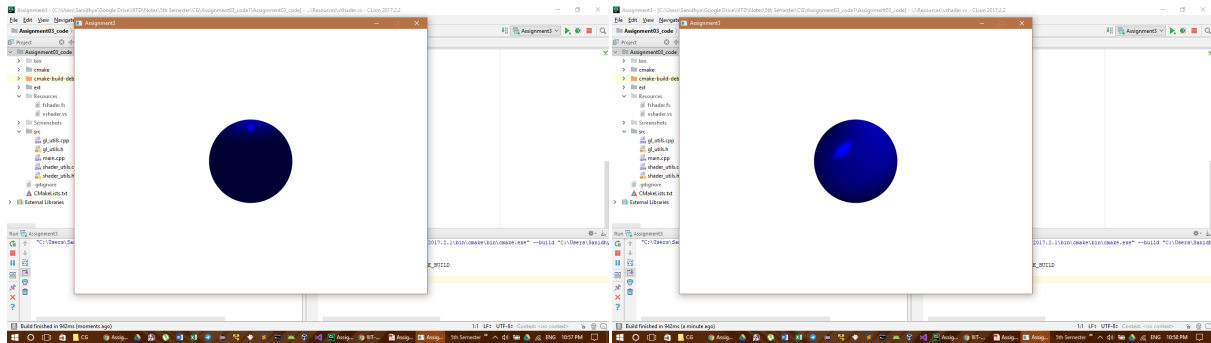
ANS 3

Phong lighting [2] involves changes in the fragment shader. Below are the screen-shots for the same:

REFERENCES

[1] The parametric equation of the sphere:
    http://mathworld.wolfram.com/Sphere.html
[2] https://learnopengl.com/#!Lighting/Basic-Lighting