CS3241 Computer Graphic

Lab 3: Let there be light!

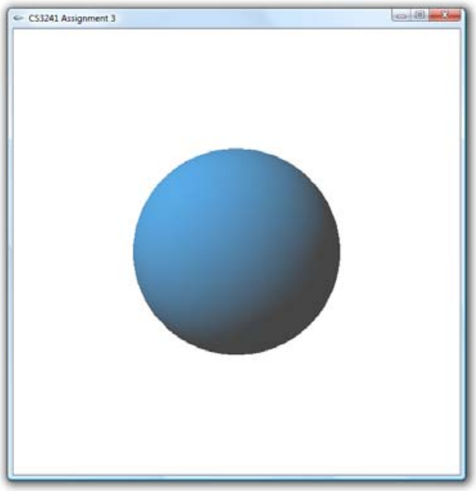
In this assignment, you will program illumination and shading in OpenGL. Play around with the sample program “**`Lab 3 sample.exe`**” to get a feeling of what you are going to do. With pressing 1-4, you can switch among different scenes. By pressing ‘S’, smooth shading will be toggled between flat shading and smooth shading. And in the same manner, ‘H’ is for highlight (specular reflection).

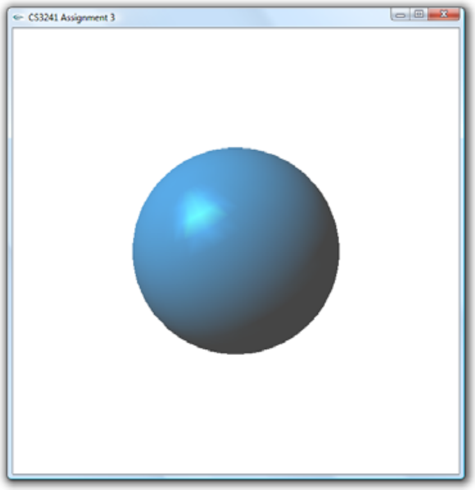
Instructions

Open the file “**`Lab 3.sln`**”. You are given a skeleton program that displays a ball with only flat shading.

Step 1: Add in the normals for smooth shading.

By pressing ‘S’, the program will switch to smooth shading and turn the variable **`m_Smooth`** to be true. You have to put in the correct normal for each vertex in the function **`drawSphere()`**. Also please put suitable comments to explain why and how your normal is computed. After adding the normal computation, your sphere should look like the figure on the left.





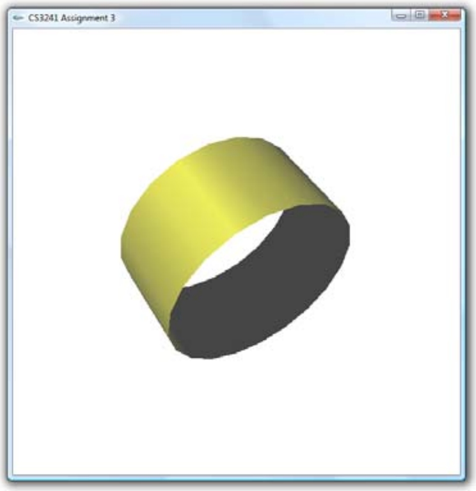
Step 2: Add in the highlight.

By pressing ‘H’, the specular term will be active and there should be some highlight in your object. You should put in the material property if the variable **`m_Highlight`** is on. So your sphere should look like the right figure above.

Step 3: Create your own object(s).

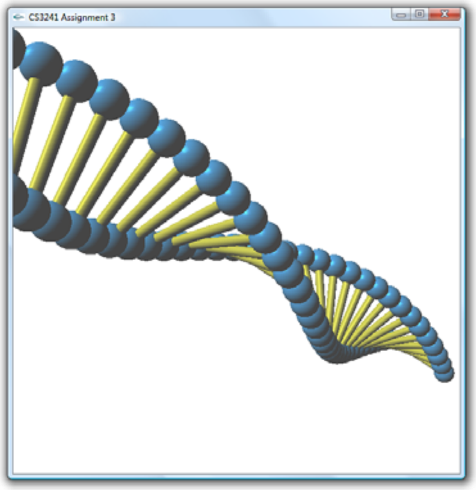
Now, it is the turn for you to show your creativity and make your own object. The main drawing routine is the function **`display()`** in the file **`main.cpp`**. Modify it if necessary and make your program to display another primitive object by pressing ‘2’. You have freedom to create any object that is not totally flat. Namely, your new object **must** have some curved surfaces, e.g. an ellipsoid, a cone, a paraboloid, etc.

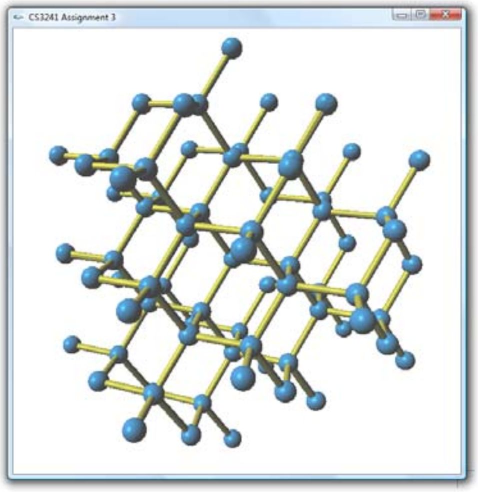
Do not create an object which only consists of flat surfaces such as a cube or a tetrahedron. Your new object must be able to be displayed in **all** flat shading, smooth shading and with or without highlight modes. You can create more than one primitive object if you want.



Step 4: Create your own composite objects.

A composite object is constructed by various transformations and copies of your primitive objects. Construct a function to display your composite objects and name your creation an artistic title. The sample program gives two such objects, the one in the very first beginning of this document is called “Da Human Code” and another named “Diamond” in the figure below. In this assignment, construct two such composite objects (for ‘3’ and ‘4’).





We will grade how innovative and beautiful your objects are as well as how compact and clever your program is, e.g., the examples above are only about ten lines of C++ code. However, please do NOT create any offensive objects that cause any harassment.

In this assignment, you cannot use any library, e.g. `drawSolidSphere()` in GLUT library, to help you create an object. You must specify the polygon vertices of your object by yourself.