

In this assignment, you will add the shading functions to the Gz library, includes Gouraud shading and Phong shading. With your provided API functions, the main application will read series of triangles from the text file **Tris.txt** and draw the tea pot. This time, **Tris.txt** also provides you the normal vectors of the triangles.

All the data you need for this assignment is put in the zip file **hw4.zip**. You need to complete several functions in files **Gz.h**, **Gz.cpp**, **GzFrameBuffer.h**, and **GzFrameBuffer.cpp**. You are provided some matrix and vector manipulation tools in the files **GzMatrix.h** and **GzVector.h**. You are also provided the solution for assignment 3. Feel free to use the provided materials or use your own source code.

Here are some details you may need to pay attention:

1. The Gz library should support many light sources. Here we only consider directional lights from infinity. Each light source is described by a pair (v, c), v is a 3D vector (**GzVector**) specifying the direction of the light and c is the color of the light (**GzColor**). Note that the directions of the lights are also affected by transformations, which means the light directions are unchanged compared to the tea pot.
2. Beside the colors for every vertex of the object, we also define the material property. This material property contains four real numbers: kA, kD, kS, and s. They are ambient coefficient, diffuse coefficient, specular coefficient, and power spec respectively. Please check the lecture 7 for more details.
3. When doing the transformations, you also need to transform the normal vectors with a little bit different. Check the lecture 8 for this issue. Your normal vector calculation is expected to work with an arbitrary transformation. However, if you cannot do this, use the ad-hoc solution by taking only rotations of **Gz::rotate()** and the rotation part of the **Gz::lookAt()**. In this case, you will lose not much credit.
4. The format of the **Tris.txt** has changed. After the first 3 numbers represent for vertex coordinate, we have added 3 numbers represent for normal vector of the vertex. The last 4 numbers still represent for color of the vertex.