

Homework 4: Shading

COSC6372 Interactive Computer Graphics (Spring 2023)

DUE: APRIL 1, 2023 AT 11:59 PM

1. Introduction

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. 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.

2. Notes

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: k_A , k_D , k_S , and s . They are ambient coefficient, diffuse coefficient, specular coefficient, and power spec respectively. Please check the lecture 12 for more details.
3. When doing the transformations, you also need to transform the normal vectors with a little bit different. 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.

3. Requirements

1. Do the assignment independently.
2. You must submit all your source code, project files (MSVC project or Makefile), your results and your report. TA may test your implementation by changing some options, changing the source code of the main program or changing the data file.

3. You need to write a detailed report (50% points of the assignment, pdf format), you should state the assignment problem, explain the algorithm or method you use, explain details of implementation, discuss your results, etc.
4. Save your results as images.
5. Upload every necessary file to GitHub
6. In your GitHub readme file, put your name and student ID there, including the coding environment and compiling method (command) if necessary.
7. You can only use the libraries we provided.
8. You will lose points if violate any requirement above.