311170030 Introduction to Computer Graphics

Assignment 1: Creating a 3D Scene (20%)

Due Time: 12:00pm, Oct 31 (Wednesday), 2018

Late penalty: 10% per day.

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I. Introduction

This first programming assignment will introduce you to the OpenGL graphics programming interface. In this programming assignment, you will be creating different 3D objects to model interesting shapes. The objective of this assignment is to apply your understanding of the computer graphics theories and give you an introduction to the OpenGL programming library.
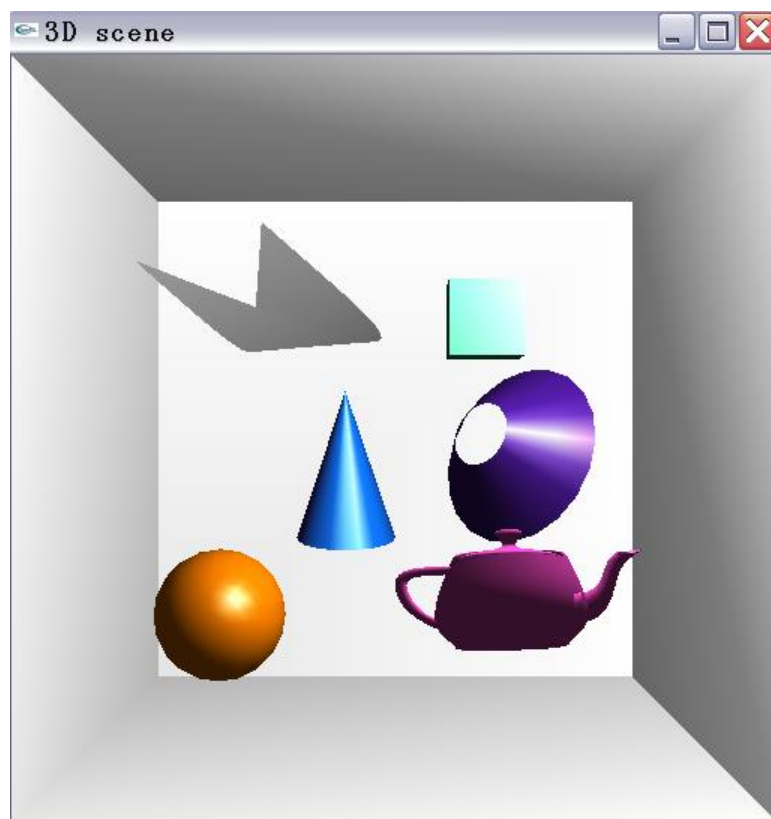

Fig. 1 The scene drawn by the demo program

Your goal is to design a 3D space, which consists of five planes, i.e., the left, right, and back walls, the ceiling and the floor, at least five different geometric primitives, such as the cone, sphere, cylinder, cube, etc. And you should be able to apply arbitrary transformations — translation, rotation, scaling — to them. The user should be able to use the keyboard (and/or the mouse) to translate, rotate, and scale the object. After you have implemented all the basic functionality, we expect you to construct an interesting scene with your program. In

order to make your scene more realistic, you should use the perspective projection instead of orthographic projection.

II. Implementation Details

In this assignment package, we have provided you with a template program (i.e., *submit.c*) that includes the necessary functions you are going to use and callback functions in the GLUT interface toolkit. Use this template as the basis for your implementation. There is also a file (i.e., *readme.txt*) indicating the keyboard usage of the demo program (i.e., *demo.exe*) for the users. You may design your own function to process the keyboard events, but you should also submit a file like this to specify the keyboard (and/or mouse) events you designed in your program. Otherwise, the mark for related items will be deducted.

All programs should meet reasonable programming standards: header comment, in-line comments, good modularity, clear printout, efficiency.

Constraints:

1. Draw at least five geometric primitives in the 3D space bounded by the five planes;

2. Ensure the objects are in good lighting condition;

3. Create at least 5 and at most 10 keyboard or mouse events;

4. Design diverse objects transformations, such as rotation, translating, scaling;

5. Use perspective projection to draw the scene;

6. Set interesting material properties to different objects.

Non-constraints

You are free to add objects, move them, deal with their material attributes, and whatever you wish to make your scene interesting.

III. Grading Scheme

Your assignment will be graded by the following marking scheme:
*   Planes (the left, right, and back walls, the ceiling and the floor)   15%
*   At least five different geometric primitives   20%
*   Five to ten keyboard events (mouse event is optional)   15%
*   Object transformation animation   20%
*   General scene organization and lighting control   15%
*   Creativity   10%
*   Programming style   5%

Total   100%

Note: no grade will be given if the program is incomplete.

IV. Guidelines to submit programming assignments

1) You are suggested to write your programs on Windows, since there will be enough technical support. If you developed the program in other platforms, *make sure your program can be compiled and executed on Windows as the program will only be tested on this platform*.

2) Modify the provided *submit.c*, and provide all your code in this file. No more additional .c or .h files are allowed. Type your full name and student ID in *submit.c*. *Missing such essential information will lead to mark deduction*.

3) Zip the source code file (i.e. *submit.c*), the executable file (i.e., *submit.exe*), and the readme file (i.e., *readme.txt*) in a .zip or .rar file. Name it with your own student ID (e.g. 2014333333.zip). That is, there should be exactly **three** files in your submitted package.

4) Mail the zip file to the mailbox: *jxguo_scu@163.com*

5) An acknowledgement email will be sent to you once your assignment is received. Otherwise, resubmit your assignment since you have submitted a null email.

6) In case of multiple submissions, only the latest one will be considered.

7) *Fail the course if you copy.*