

## Computer Graphics, Lab Assignment 7

Handed out: April 13, 2021

**Due: 23:59, April 13, 2021 (NO SCORE for late submissions!)**

- Only accept answers submitted via git push to this course project for you at <https://hconnect.hanyang.ac.kr> (<Year>\_<Course no.>\_<Class code>/<Year>\_<Course no.>\_<Student ID>.git).
- Place your files under the directory structure <Assignment name>/<Problem no.>/<your file> just like the following example.

```
+ 2021_ITE0000_2019000001
+ LabAssignment7/
+ 1/
+   - 1.py
+ 2/
+   - 2.py
+ 3/
+   - 3.py
```

- The submission time is determined not when the commit is made but when the git push is made.

1. Write a program that draws a color-changing cube.

- Set the window title to **your student ID** and the window size to (480,480).
- Start from the code in 7-Lighting&Shading slides. Draw a flat-shaded cube. Make sure camera manipulation shortcuts '1', '3', '2', 'w' work.
- Use the following light setting:

```

lightPos = (3.,4.,5.,1.)
glLightfv(GL_LIGHT0, GL_POSITION, lightPos)

ambientLightColor = (.1,.1,.1,1.)
glLightfv(GL_LIGHT0, GL_AMBIENT, ambientLightColor)

specularObjectColor = (1.,1.,1.,1.)
glMaterialfv(GL_FRONT, GL_SPECULAR, specularObjectColor)

glMaterialfv(GL_FRONT, GL_SHININESS, 10)

```

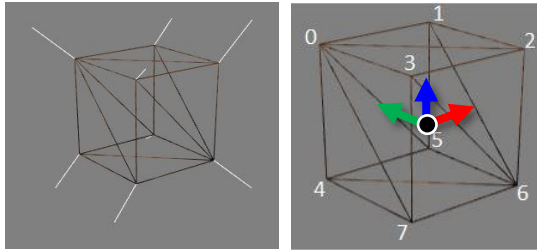
- D. If you press or repeat a key, the diffuse & specular color of the light and the ambient & diffuse color of the object should be changed as shown in the Table:

Key	Action
A	Change the light color to red
S	Change the light color to green
D	Change the light color to blue
F	Change the light color to white
Z	Change the object color to red
X	Change the object color to green
C	Change the object color to blue
V	Change the object color to white

- E. Files to submit: A Python source file (Name the file whatever you want (in English). Extension should be .py)

2. Write a program that draws a smooth-shaded cube.

- Set the window title to **your student ID** and the window size to (480,480).
- Start from the code in 7-Lighting&Shading slides. Make sure camera manipulation shortcuts '1', '3', '2', 'w' work.
- Use **glDrawElements()**, not glDrawArray(). Refer the code in 6-Viewing&projection2, Mesh slides.
  - Hint: In Gouraud shading, one vertex has only one normal. This makes using glDrawElements() easier.
- Use the following normal vector data:



vertex index	position	normal
0	( -1 , 1 , 1 )	( -0.5773502691896258 , 0.5773502691896258 , 0.5773502691896258 )
1	( 1 , 1 , 1 )	( 0.8164965809277261 , 0.4082482904638631 , 0.4082482904638631 )
2	( 1 , -1 , 1 )	( 0.4082482904638631 , -0.4082482904638631 , 0.8164965809277261 )
3	( -1 , -1 , 1 )	( -0.4082482904638631 , -0.8164965809277261 , 0.4082482904638631 )
4	( -1 , 1 , -1 )	( -0.4082482904638631 , 0.4082482904638631 , -0.8164965809277261 )
5	( 1 , 1 , -1 )	( 0.4082482904638631 , 0.8164965809277261 , -0.4082482904638631 )
6	( 1 , -1 , -1 )	( 0.5773502691896258 , -0.5773502691896258 , -0.5773502691896258 )
7	( -1 , -1 , -1 )	( -0.8164965809277261 , -0.4082482904638631 , -0.4082482904638631 )

- E. If you press or repeat a key, the ambient & diffuse color of the object should be changed as shown in the Table:

Key	Action
R	On/Off the object color of red
G	On/Off the object color of green
B	On/Off the object color of blue

- F. Expected result: Uploaded LabAssignment7-2.mp4
- G. Files to submit: A Python source file (Name the file whatever you want (in English). Extension should be .py)