Computer Graphics  
Class Assignment 2

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# Which requirements I implemented (5 pts)

1. (10 pts) Manipulate the camera in the same way as in ClassAssignment1 (**done**)
2. (50 pts) Single mesh Rendering Mode
   1. (40 pts) Open an obj file, parse it, and display the mesh only using vertex positions, vertex normals, faces information by drag-and-drop (**done)  
      -** 고속 렌더링을 위해 python concurrent.futures 패키지를 이용해 별도의 프로세스에서 obj 파일을 읽어 필요한 데이터만 산출하여 병렬 렌더링 함
   2. (10 pts) Print out some information about the obj file to stdout (**done**)
3. (55 pts) Animating hierarchical model rendering mode
   1. (10 pts) The model should consist of at least 3 different meshes loaded from 3 different downloaded obj files (**done**) - 7개의 obj 모델을 불러와 사용함
   2. (10 pts) You should use OpenGL matrix stack to draw and animate your hierarchical model (**done**)
   3. (15 pts) The model should have a hierarchy of 3 levels and each node (except leaf nodes) should have at least 2 child nodes. (**done)**
   4. (20 pts) Animate the model to show the hierarchical structure (**done**)  
      **-** Building - Bugatti - Male, Cow

- Plane - Cat, Skeletons

1. (20 pts) Lighting & Etc
   1. (10 pts) Use multiple light sources to better visualize the meshes (**done**)
   2. (10 pts) Toggle wireframe / solid mode by pressing **Z** key (**done**)
2. (20 pts) Extra Credits
   1. (+10 pts) Forced smooth shading by toggling **S** key (**done**)
   2. (+10 pts) Mesh Triangularization (**done**)

# Uploaded Video Link (5 pts)

[유튜브 링크](https://youtu.be/ArXzxCN6KR0)

## Image Image

|  |  |
| --- | --- |
| Normals from obj file | Computed Avg Normals |
| Image  3D 모델 디자이너가 의도한 normal 대로 표현된다 | Image  원래 mesh의 굴곡을 도드라지게 표현한다 |

# Light Configuration (5 pts)

Single Mesh Rendering Mode (3개)

(1) 광원 위치 (3, 4, 5), 점 광원, 색: 흰색  
(2) 광원 위치 (-5, 4, -3), 점 광원, 색: 흰색  
(3) 광원 위치 (0, 5, 10), 유향 광원, 색: (1, 1, 0.9)

Hierarchical Animation Mode (2개)

(1) 광원 위치 (30, 30, 30), 유향 광원, 색: 흰색  
(2) 광원 위치 (-30, 70, -30), 유향 광원, 색: 흰색