CS 550000 Computer Graphics
Homework2 Transformation on Models, Viewing, Projection

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PROJECT ABSTRACT

I start my work based on homework one. First setting up the shader program environment and updating display function before going on this project. And then update the normalization procedure in homework one with matrixes' multiplication, then finally use multiple matrixes to construct the user's operations on the models, viewing, projection.

WORKS

I first merge my code with TA's homework two framework, such as uniform location binding with main program in shader program and new displaying method with default M, V, P transform matrixes' product. And then refactor my class object ModelView and Model to work around this project.

Class object `Model` contain all the necessary information from *glm model* object including vertices, triangles info. The most important part is each `Model` object has its own normalization and transformation data that means: **each model has its independent translation, scaling, rotation and normalization matrixes**.

Class object `ModelView` is the main module to serve the displaying objects. It maintains all models' *.obj* files in program world, and performs the controls of previous or next model commands to switch between models. Moreover, it **keeps a group of `Model` objects in module which means it has ability to show unspecified multiple (one or more) models at the same time**. With `focus` keyboard control, it can easily perform transformation on any single model in the window view.

EFFORTS

Finish some advanced functions and controls, the program can display multiple models, this time I give it a constant, four. The default displaying mode will show four models in four quadrants and can switch to single displaying mode as the homework one. And **each model can perform geometrical transformation individually, viewing and projection transformation globally**. The **advanced control contains translation with left mouse dragging and scrolling to scale the model**.

SNAPSHOTS

1.1 DISPLAY MULTI-MODELS
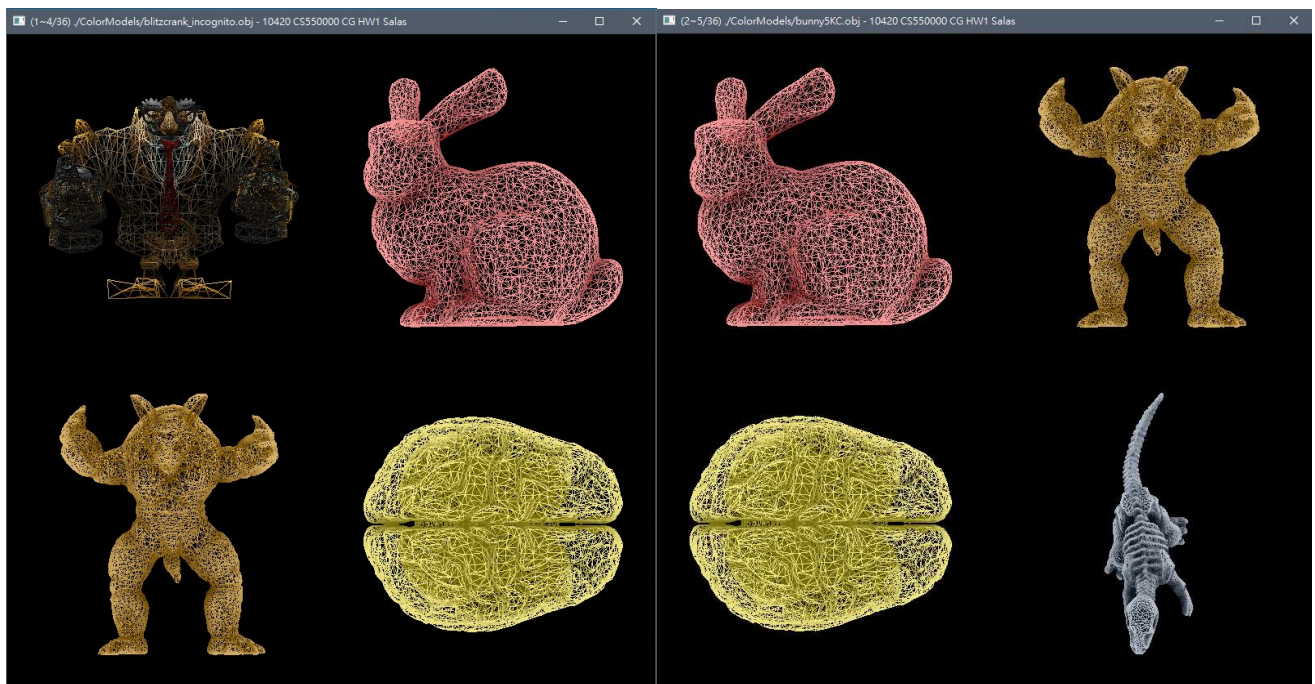- It can display any four of models and keep in the order when loading.

Figure 1. Model#1 ~ Model#4
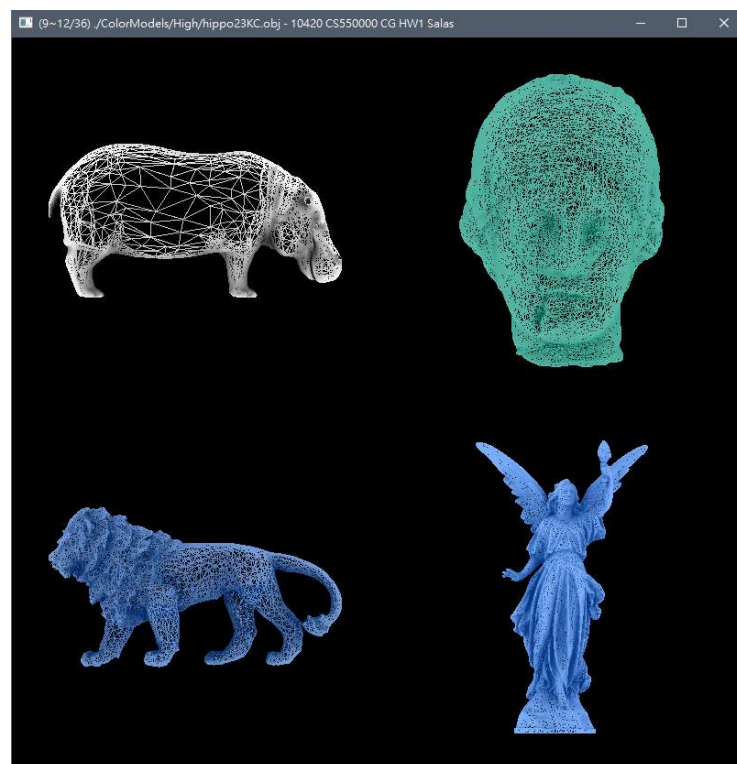

Figure 2. Model#2 ~ Model#5

Figure 3 Model#9 ~ Model#12

1.2 GEOMETRICAL TRANSFORMATION

- Operation on individual model, including translation, scaling, and rotation.
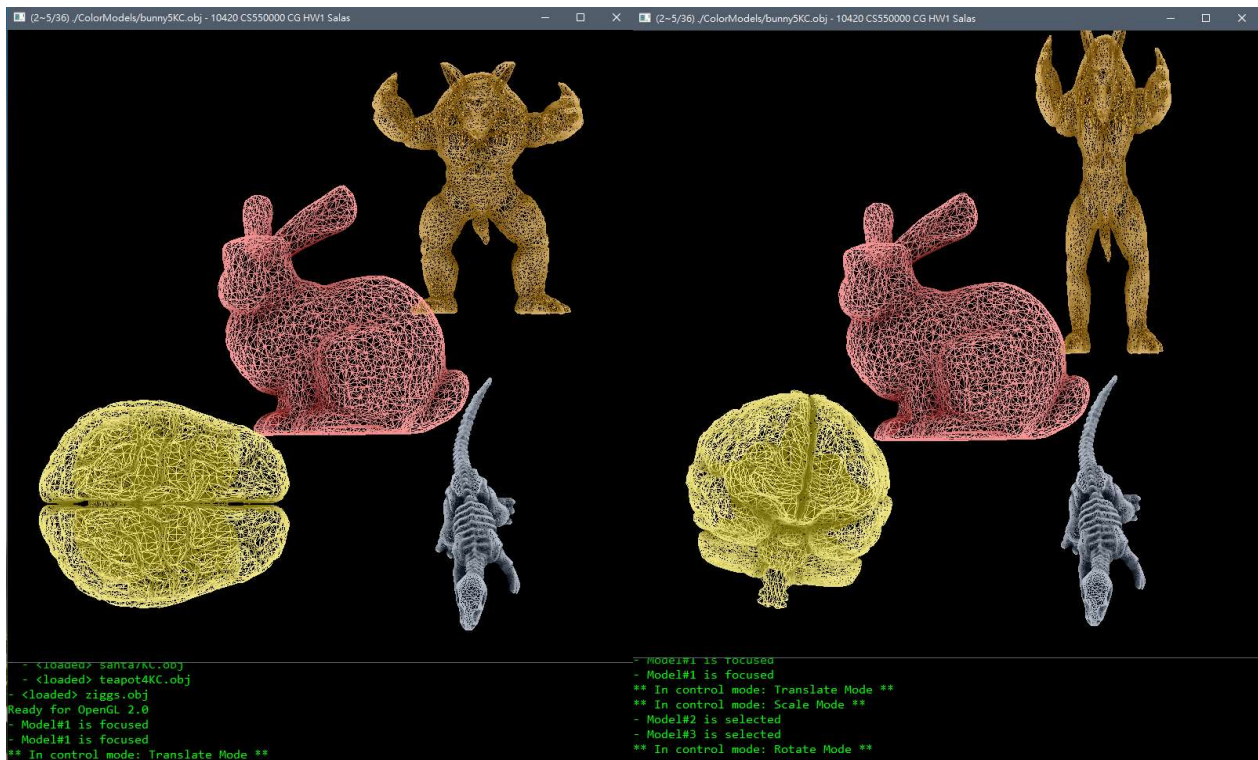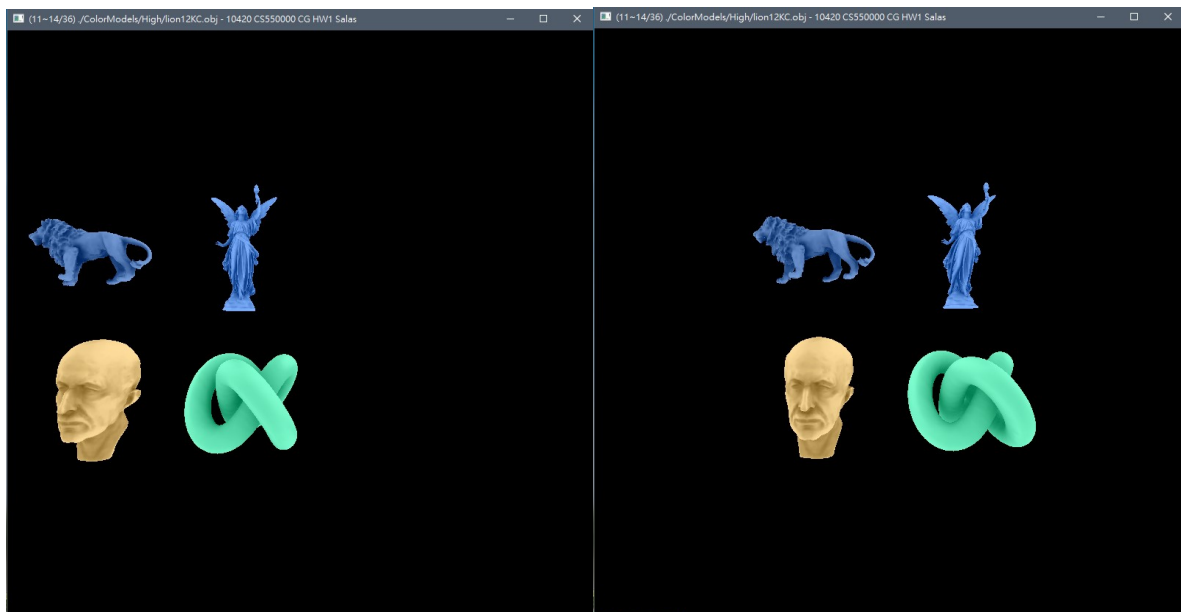

Figure 4. Translation on rabbit, scaling on monster, rotation on brain

1.3 VIEWING AND PROJECTION

- Moving camera (eye) position, and projection toggle mode.

1.4 HELP MENU

- List all commands, and all key bindings are case-insensitive.

```
#############################################################
*                          Help doc                         *
***             All commands are case-insensitive         ***
#############################################################


Controls:
-       T : Translate Mode
-       R : Rotate Mode
-       S : Scale Mode
-       E : Camera(Eye) Mode
-       P : Toggle parallel/perspective projection Mode

-       Q : Reset model(s)
-       G : Toggle gallery/single model Mode (testing)
-       W : Toggle wireframe/solid Mode


-       H : Help menu

Operations:
-       L / J: positive X / negative X
-       I / K: positive Y / negative Y
-       M / O: positive Z / negative Z

-       X : Select(Focus) next model
-       Z : Select(Focus) previous model
-       ->: Next model(s)
-       <-: Previous model(s)
-       Scroll: scale up/down model
-       Left Drag: translation on model
```
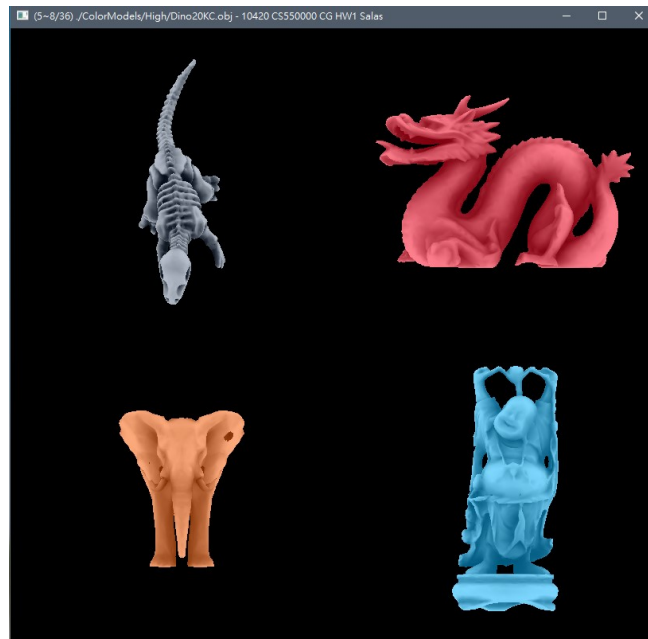
1.5 DISPLAY INFORMATION

- This will inform user which model is selected and which model will be transformed.

```
- Model#2 is selected
- Model#3 is selected
- Model#4 is selected
- Model#1 is selected
- Model#4 is selected
- Model#3 is selected
- Model#2 is selected
- Model#1 is selected
```

1.6 GALLERY MODE

- Can display four models at the same time, and can also change to single model mode.

Left shows the situation when press 'G', it'll hide other models with title still labeling 5th ~ 8th of 36; the right is the situation when change to next model after toggling off gallery mode with label 6th of 36.