Computer Graphics

by Ruen-Rone Lee

Assignment #1

Draw some 3D models with Viewing Transformations
(Model/Viewing/Projection Transformation)

Purpose of the assignment

- ◆ **Know how to manipulate the 3D models**
- ◆ **Know how to apply model transformations**
- ◆ **Know how viewing transform affect your results**
- ◆ **Know what's the difference between parallel projection and perspective projection**
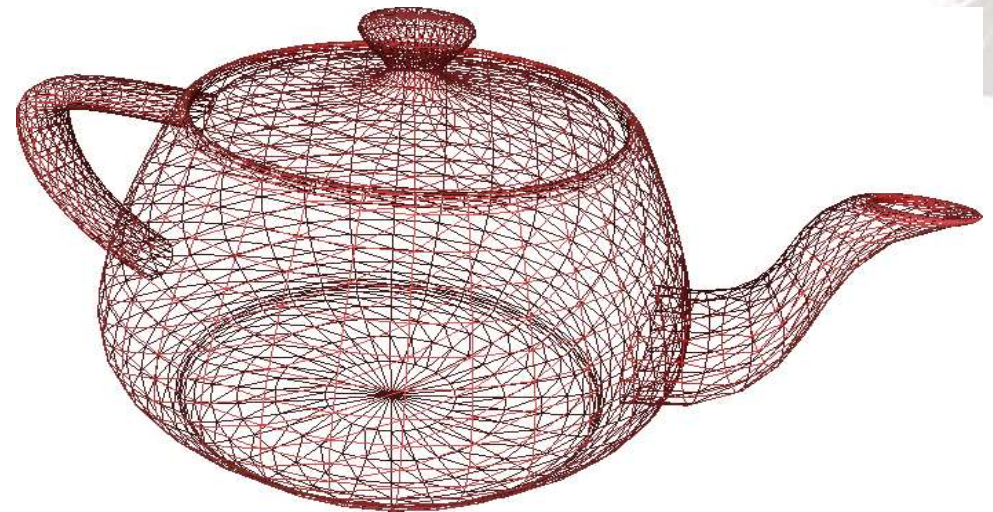
Requirements

◆ **You are required to use the framework that TA provided to draw some 3D models and display them in solid or in wireframe mode**

Solid mode

Wireframe mode

Requirements

- **You are required to use the framework that TA provided to do some transformations, such as geometrical, viewing, and projection, on the input 3D models.**

- **Interactive control is required. That is, response (re-display) immediately after any mouse or keyboard action.**
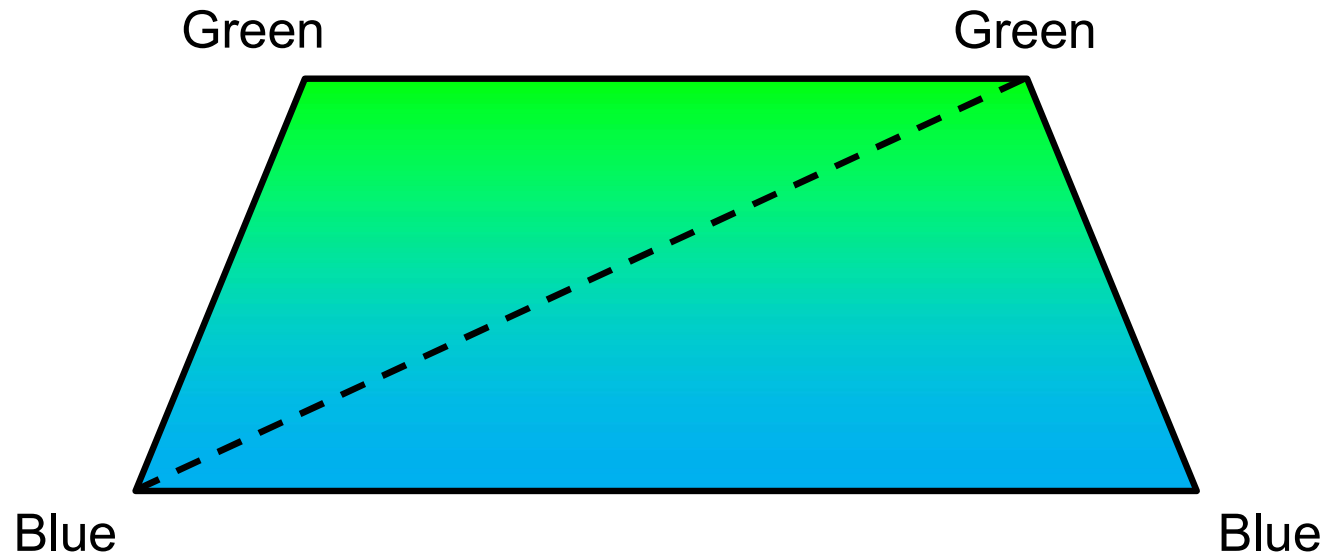
Requirements

- **All the transformations (geometrical, viewing, projection) should be implemented**
  - Geometrical transformation – translation, scaling, rotation
  - Viewing transformation – similar to gluLookAt function
  - Projection – parallel and perspective projection, similar to glOrtho and glFrustum (or gluPerspective)
 - *Notice: all fixed function OpenGL transformation APIs are not allowed*

Requirements

- **Design a "world" that can load a specific model**
- **The "world" should contain a default base floor (a square or just two triangles)**
  - **Set the vertex colors so that the floor is displayed with the color you assigned. For example,**

Green   Green

Blue   Blue

Requirements

◆ **Load a specific 3D model and display it with default viewing**

  ■ **Load a specific model as provided by TA's codes**
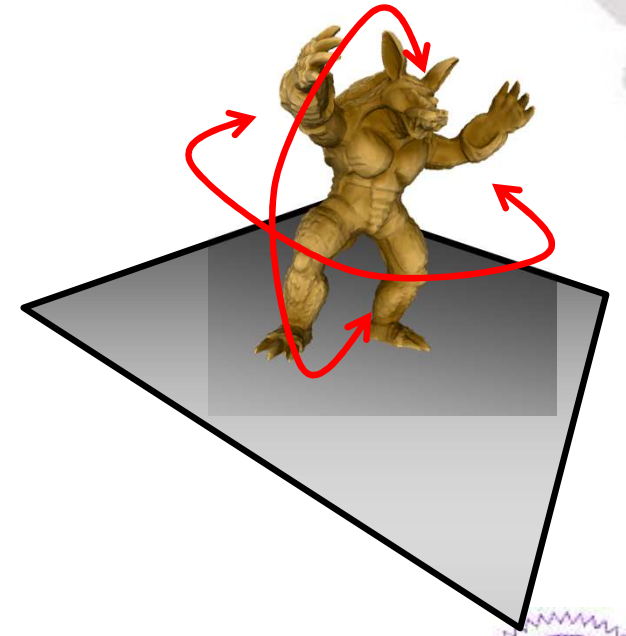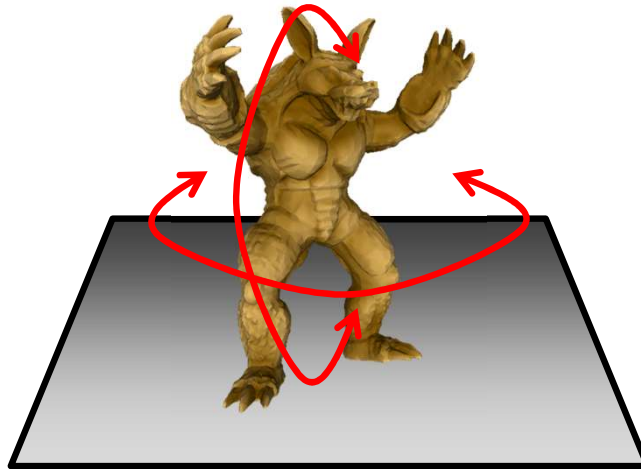 ■ **Place the model properly "above" the base floor**
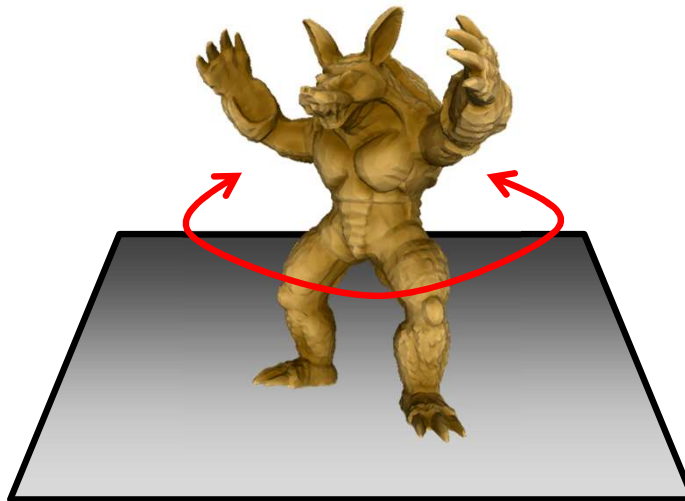
  ■ **Press a key to enable self-rotate in y-axis**

Requirements

- ◆ **Set the default viewing direction to view from positive Z to origin (toward negative Z direction)**
- ◆ **Set the default projection to perspective projection**
- ◆ **Use keyboard and mouse to do all the required transformations**
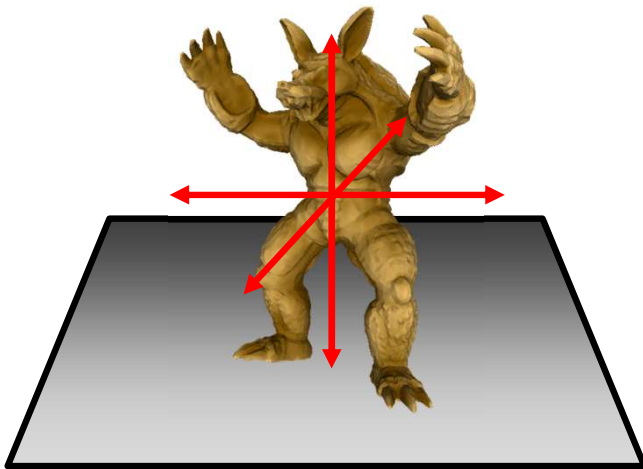
Geometrical Transformation

Viewing Transformation

Hints for the Interactive Control

- **Follow the guidelines that TA provided to write the required transformations codes such as geometrical, viewing, and projection, based on the input controls (keyboard, mouse).**

- **Apply those generated matrices in the vertex shader codes to perform the transformation with respect to the input control**

Input Model Format

- **Wavefront 3D Graphics color models provided by TA**
  - **There are some validation 3D models released to validate your design during your code development**
  - **There are also some testing 3D models that will not be released but is used for TA to test and grade your work**
  - ***Check the TA's template for how to provide a list of 3D models in running the program***
    - ▸ **TA might change the testing sets randomly**

Hints

◆ **Use TA's sample codes as the basic foundation to revise and add the functions required in this assignment**

  ■ **Framework with glfw+glad**

  ■ **Model loader with tinyOBJ**

◆ **Set the viewing direction always from the eye position to the origin (assume the model has been normalized and placed at the origin)**

Hints

- **The base floor will be seen only when the viewing direction is not aligned with the z-axis**

- **For geometrical transformation, it should apply to the model only**

- **For viewing transformation, it should apply to both the model and the base floor**

Hints

- **You have to illustrate your control clearly so that TA can justified the correctness of your implementation**
- **You are required to demonstrate the implementation to TAs if there is a need**
  - **Operations incorrect**
  - **Insufficient documentation for the operations**
  - **Book the time with TAs before you go or check with them after class**

Hints

◆ **Check with TAs if you would like to demonstrate your work personally**

- ■ **Any fancy operations or functions regarding the assignment**
- ■ **Any doubt to the score that TAs have graded**
- ■ **Again, check the time with TAs first or check with them after class**

Due Date

- ◆ **Three weeks after announcement (should be 5/4)**
- ◆ **Late submission is allowed with less score**
- ◆ **No score if you did not submit you assignment**
- ◆ **Plagiary is strictly forbidden**
  - ■ **If you copy from others, your score will become zero**
  - ■ **The score to the one who provide the original copy will also be downgraded**

Submission Guide

- **Please submit to course webpage at *eeclass* system**
  - *Notice: E-mail submission will not be accepted*
- **Submission should include**
  - **Source codes (including solution and project files)**
  - **Executable binary (can be run on PC/windows)**
  - **Documentation (explain how you did it and how to operate it)**
  - *Notice: please do not submit any 3D models to save the disk space*
- **Contact with TAs if you have problem in submission**

Q&A