

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**

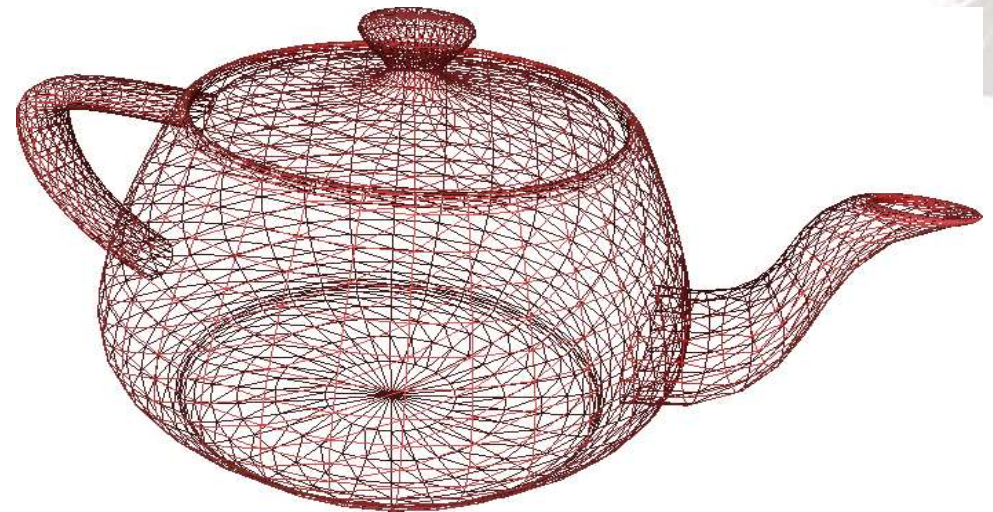


Requirements

- ◆ 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.



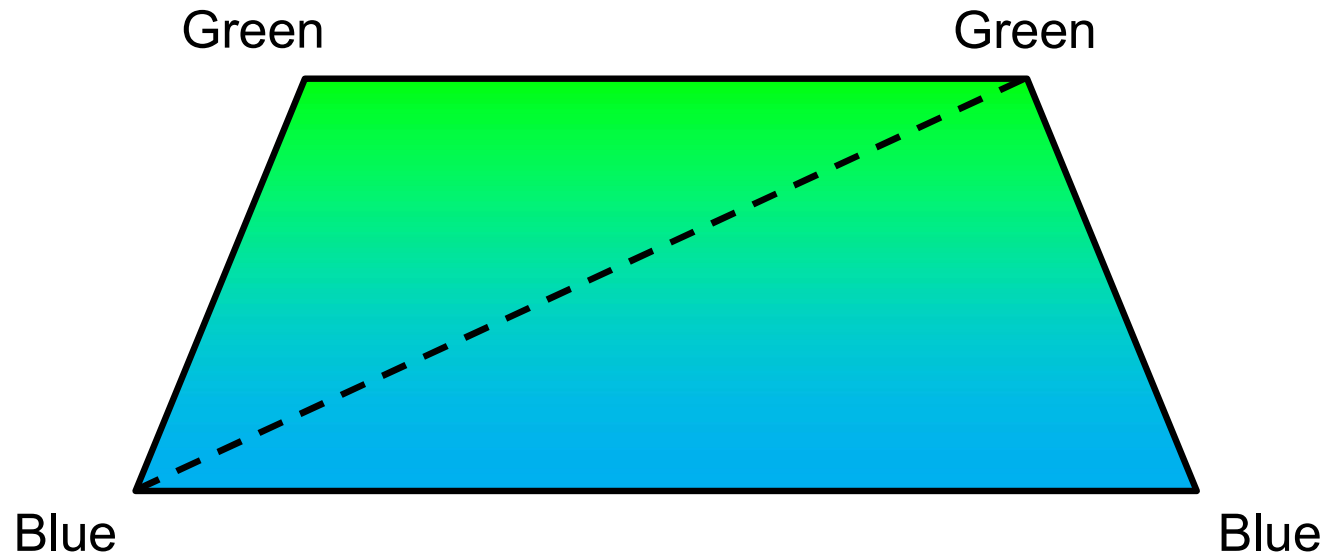
Requirements

- ◆ **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***



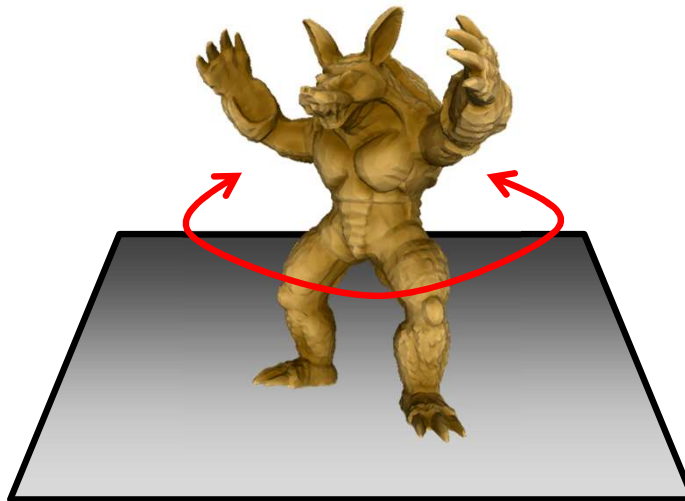
Requirements

- ◆ 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,



Requirements

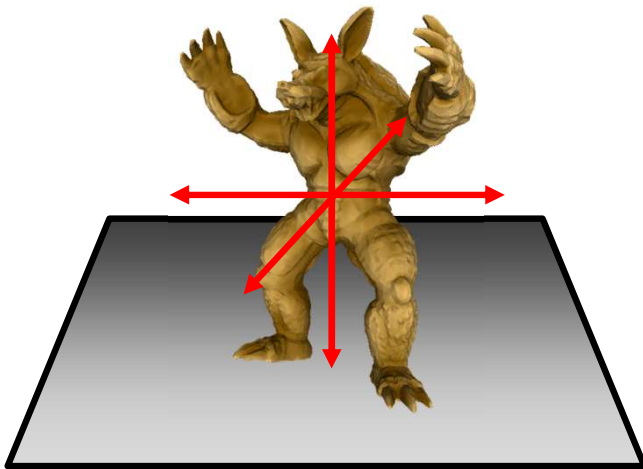
- ◆ Load a specific 3D model and display it with **default viewing**
 - Load a specific model as provided by TA's codes
 - Place the model properly “**above**” the base floor



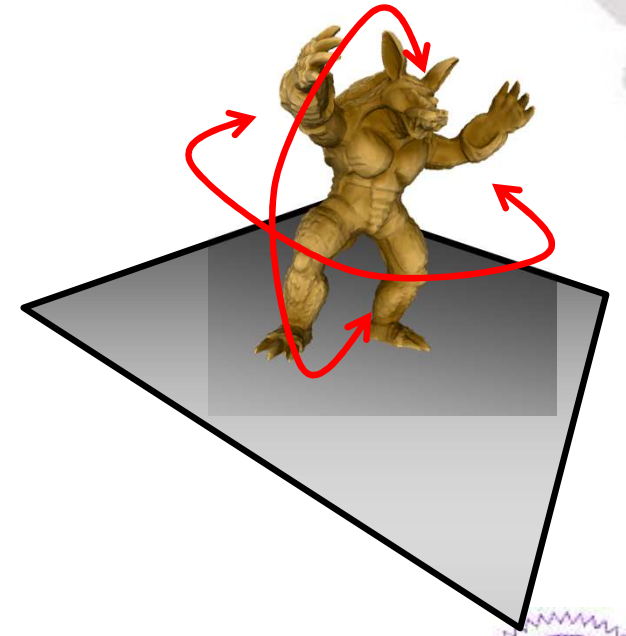
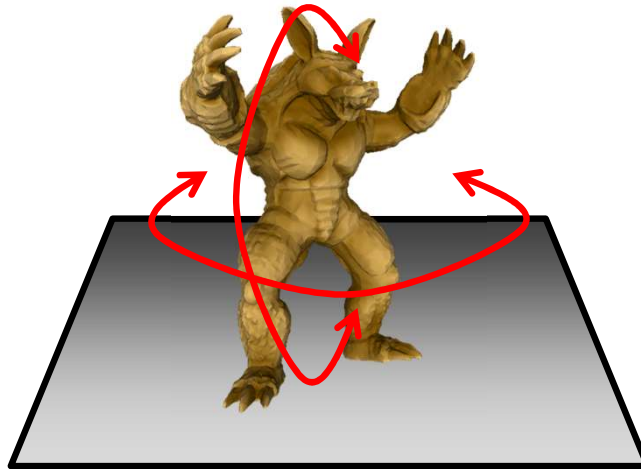
- Press a key to enable **self-rotate** in y-axis

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

- ◆ For geometrical transformation, it should apply to the model only
 - The base floor will not move
- ◆ For viewing transformation, it should apply to both the model and the base floor
 - The base floor will move together with the model

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 **5/3**)
- ◆ Late submission is allowed with less score
- ◆ **No score if you did not submit your assignment**
- ◆ Plagiarism is strictly forbidden
 - If you copy from others, your score will become zero
 - The score to the one who provides 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

