OpenGL Viewer Report

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Compiling Instructions

Run the makefile in the terminal using ‘make’.

Operation Guide

- WASD keys to move around in the scene
- Move cursor around within the window to look around the scene
- [and] keys to scale the model up and down
- Comma and period keys to rotate the model
- Change rotation axis by pressing Z, X, or Y

Implement Model/View Transformations

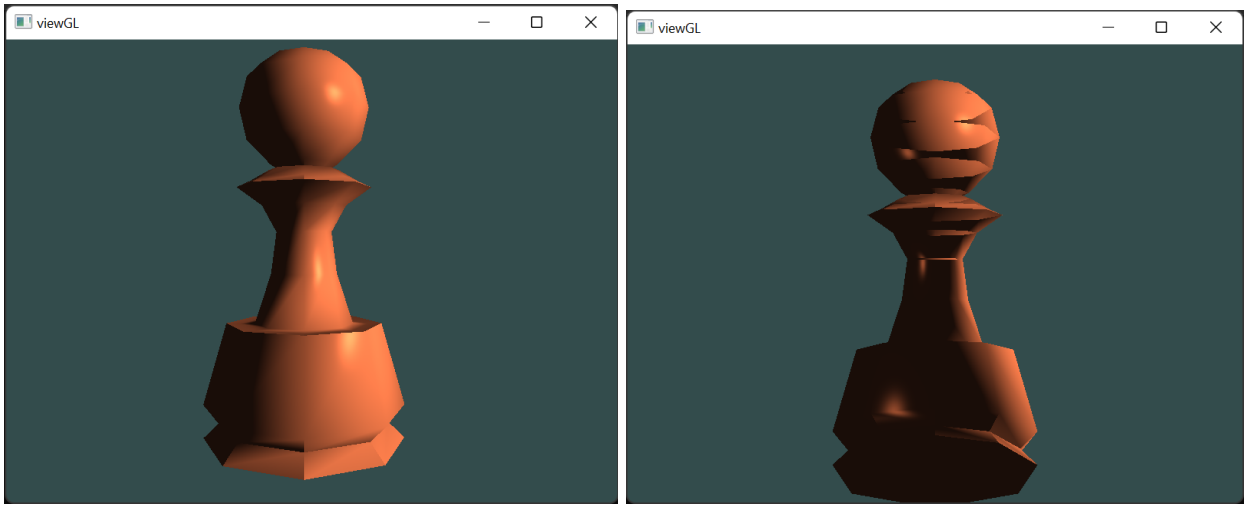
Added the ability for users to scale up or down the object by pressing the left and right bracket keys. This is done by having a scale variable that is updated in the processInput function every time the corresponding keys are pressed. In the render loop a mat4 is then created with the scale variable and multiplied with the vertex positions in the vertex shader.

Implement Rotation Around an Axis

Added the ability for users to rotate the object around an axis of their choice using the comma and period keys. Users can change which axis to rotate about by pressing the Z, X, and Y keys for each axis, respectfully.

Show the Contents of Z-Buffer

Used glEnable(GL_DEPTH_TEST) to show the contents of the z-buffer. When rotating the model, the vertices/faces at the front are rendered first.



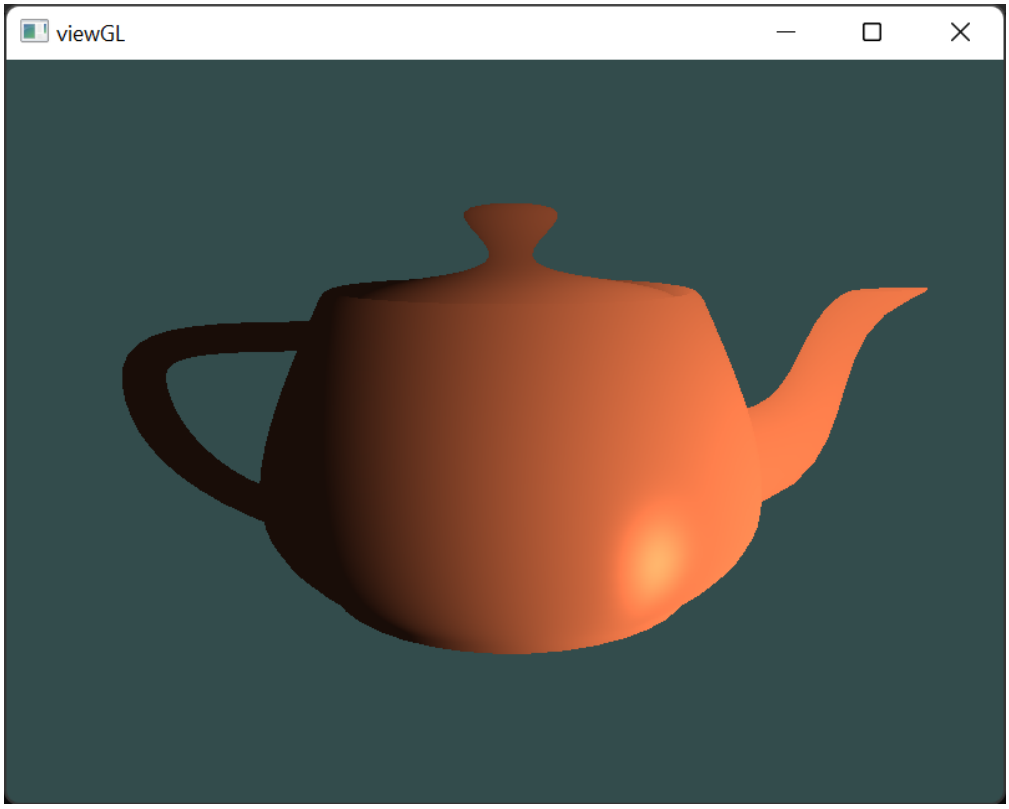
glDepthFunc(GL_LESS) vs. glDepthFunc(GL_ALWAYS)

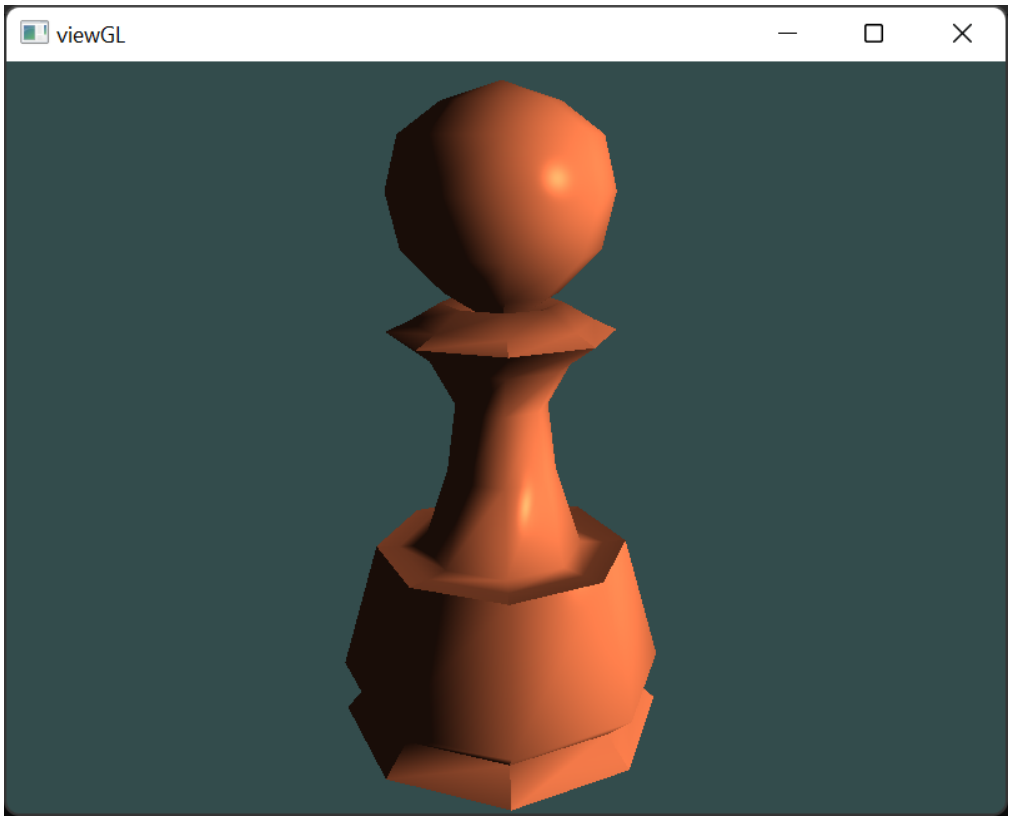
Gouraud and Phong Shading

Implemented Gouraud and Phong shading by modifying the vertex and fragment shader source code files. Gouraud and Phong shading are implemented in separate .vs and .fs files. To implement one of them in the program, pass in to the shaders “gouraud.vs” and “gouraud.fs” for Gouraud shading and pass in “phong.vs” and “phong.fs” for Phong shading.

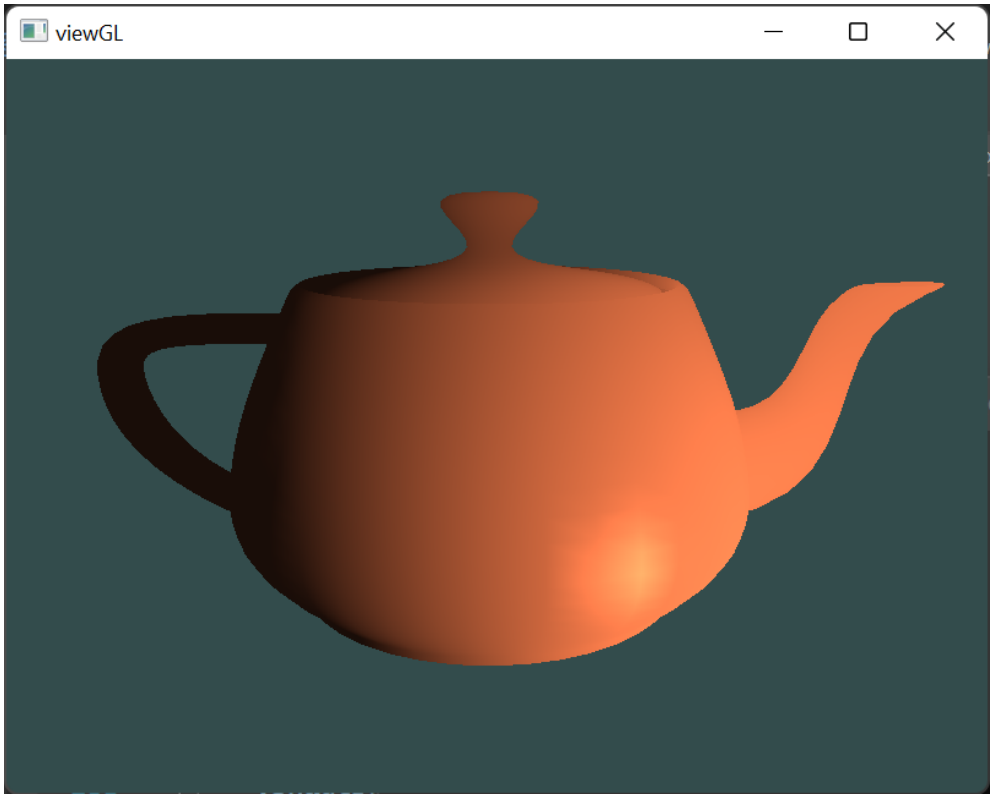
In Phong shading, the interpolation of colors look smoother compared to Gouraud shading. In Gouraud shading you can see the edges of the triangles around the specular lighting spot. This is more visible when rotating the model. Specular lighting also looks more visible in Phong shading.

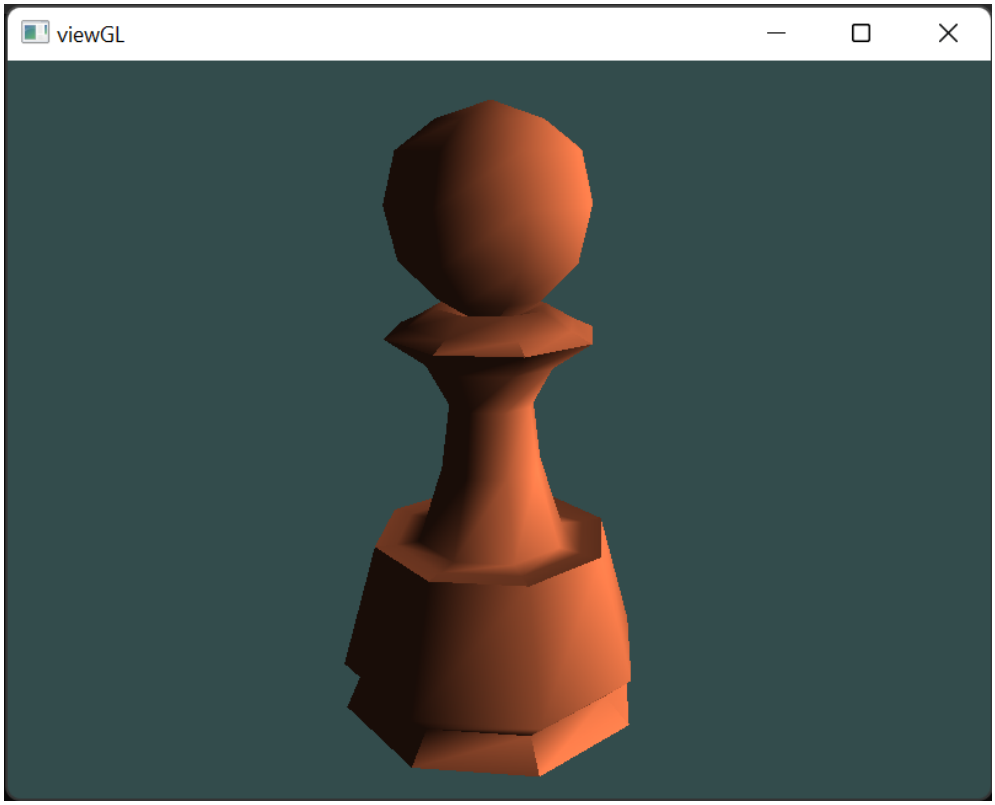
Phong Shading





Gouraud Shading





Rotate Scene Based on Mouse Input

Added the ability for the user to move around the scene by changing the camera position. Users can move around using the WASD keys. I also added the ability for users to look around the scene by moving the cursor around within the window.

Requirement Checklist

- ☑ ~~Implement model/view transformations in your viewer that allows the user to scale the object up by keyboard.~~
- ☑ ~~Add a rotation functionality around an axis of your choice.~~
- ☑ ~~Implement functionality to show the contents of z-buffer in order to see the depth of points in the scene.~~
- ☑ ~~Add lighting effects by implementing Gouraud and Phong shading. Show and describe the effects of each shading in your experiments.~~
- ☑ ~~Bonus: Design and implement an interaction mechanism for animating the scene with a rotation based on mouse input.~~

Acknowledgements

https://learnopengl.com/Getting-started/Transformations for scaling and rotating the model.
https://learnopengl.com/Advanced-OpenGL/Depth-testing for showing the z-buffer.
https://learnopengl.com/Getting-started/Camera for moving the camera and rotating the scene based on cursor location.
https://learnopengl.com/Lighting/Basic-Lighting for help with Gouraud and Phong shading.