CSC4820/6820 Interactive Computer Graphics

Fall 2014

Homework 2

Due date: 11:59 pm October 28, 2014 (Tuesday)

The aim of this homework is to help improve your understanding the process of loading and displaying a 3D model as well as the structure of an OpenGL/GLSL program.

Answer the following questions. Use your code from project 1 or this [sample program](https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxnc3Vjb21wdXRlcmdyYXBoaWNzfGd4Ojg3MDlhM2Y5NDFiMjU2Ng) as examples. If possible, use code segments as examples to answer the questions.

* Briefly describe the process of loading a 3D model and display it using OpenGL/GLSL.
* Briefly describe the following data structure stored in Assimp’s aiScene object: node tree, mesh, face, face indices.
* Describe the relationship among node tree, mesh, vertices, faces, and face indices.
* For basic 3D model display, what do we really want to retrieve from an aiScene object?
* What are vertex arrays and element arrays? What are the relationship between a vertex array and an element array from the same object?
* What are Vertex Array Object (VAO) and Vertex Buffer Object (VBO)? What's the relationship between them?
* Describe the relationship between VBOs and vertex arrays and element arrays.
* How many VAOs and VBOs are created if the dog.obj model is loaded?
* What are vertex and fragment shaders?
* In this example, what do the vertex and fragment shader do?
* How the job of displaying a 3D model is divided between the OpenGL part and the GLSL part? What are the responsibilities of the OpenGL functions? What are the responsibilities of the GLSL shaders?
* How is VAO and VBO related to shader?
* What's the purpose of glBindVertexArray() and glBindBuffer()?
* What's the purpose of glUseProgram()?
* What happens when you call glDrawElements()?
* What's the difference between glDrawElements() and glDrawArrays()?

Answer the following questions. Use your code from project 1 or this [sample program](https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxnc3Vjb21wdXRlcmdyYXBoaWNzfGd4OjNiYmUxZDJmMTg3NjlkMWE) as examples. If possible, use code segments as examples to answer the questions.

* How is the motion data stored in OpenGL and GLSL?
* Describe the process of transforming an object in OpenGL and GLSL. How is the process of transformation divided between the OpenGL part of the program and the GLSL part of the program?
* Describe the purpose of model matrix, view matrix, and projection matrix. What is the relationship between these matrices and vertex positons?
* What is glm library used for?
* What’s the purpose of glViewport() function?
* What is the purpose of putting a vertex through model transformation, view transformation, projection transformation, and viewport transformation?
* How do you control the animation of an object via keyboard or mouse?

Submit the report in text, Word, or PDF files to Desire2Learn under the dropbox “Homework2”. Write your name in the report.