Lab 1 — HW2d Program Analysis

CS 320

Lab objectives:

- To observe and understand the differences between the Hw2d program discussed in the textbook and the actual Hw2d program with which we'll be working.
- To focus upon the sections of Hw2d that will have to be modified to successfully complete Project 1.

There are differences between the Hw2d program discussed in Appendix A of the textbook and the actual Hw2d program with which we'll be working. While answering the questions below, keep in mind the tasks involved in completing the upcoming Project 1:

1. Ensuring that the aspect ratio of displayed objects does not change when the program window is resized. This will be accomplished by computing appropriate horizontal and vertical scale factors in the main program's resize method and passing them in to the vertex shader as uniform attributes.
2. Adding geometry for a triangle and modifying the program to display a texture-mapped triangle that can be moved around the scene using keystrokes. This object's aspect ratio will be fixed and will use a texture different from the texture used for the square. Accomplishing this task will involve modifying the main program and providing a second shader program pair.

Main Program

Refer to the main program, asst1.cpp, for the following questions.

1. The ShaderState class includes a number of instance variables described as handle to uniform variables. What is the relationship between these instance variables and shader program variables?

   How are these variables used in the SquareGeometry class' draw method?
2. In the SquareGeometry class, describe the purpose of sqPos, sqTex, and sqCol, and interpret their values.
3. How would SquareGeometry have to be modified to create a TriangleGeometry class? Be specific.
4. Describe the additions that will have to be made to the display method to add a triangle to the scene.
5. Describe the changes that will have to be made to the display and reshape methods to ensure that the aspect ratios of scene objects remain the same when the program's window is resized.

6. In the mouse method, why are `g_leftClickX` and `g_leftClickY` computed the way that they are?

7. In the keyboard method, describe the modification necessary in using keystrokes of the 'u' key to translate the triangle in the +y direction.

   What are the implications of this for global program state and the shader programs?

8. In initGlutState, describe what is accomplished by the call to glutInitDisplayMode in your own words.

9. In initGlState, describe what is accomplished by the call to glClearColor. Be specific.

Vertex Shader

Refer to the vertex shader program for the following questions.

1. What modification would have to be made to the program to horizontally double the size of geometry?

2. What modification would have to be made to the program to vertically half the size of geometry?

Fragment Shader

Refer to the fragment shader program for the following questions.

1. What modification would have to be made to the program to color a fragment solely using texture data?