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**COSC 4328 Programming Assignment 2**

**Time: 20-24 hours**

1. **PART A: ATTRIBUTES**

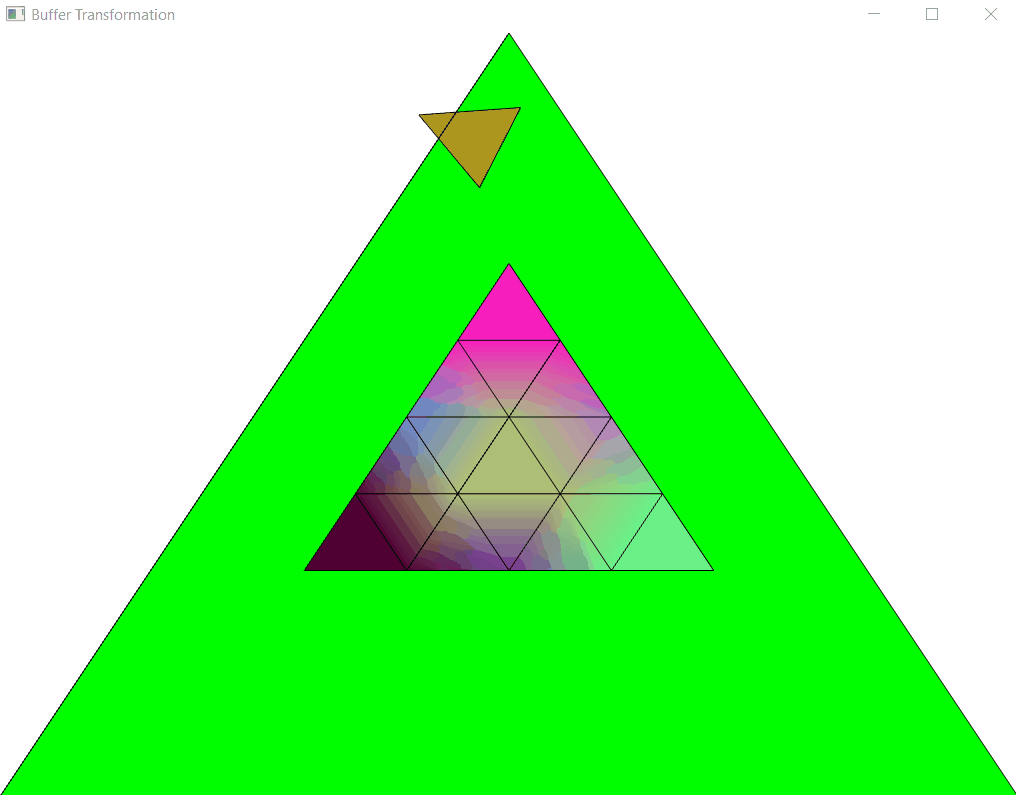


Figure 1 Another green triangle

1. **PART B: TRANSFORMATION**

The gif can’t be animated in Word format, so the picture should be the same as Figure 1. See the gif for the visualizaion.

1. **PART C: EXTRA GEOMETRY**

The same as part B, I can’t insert the gif here.

1. The code has 21 vertices and 18 triangles, in which 16 of them share an edge. In terms of coloring, 6 of them have a solid color, which are the first green triangle, the rotating triangle at top, and 4 in the pyramid (3 triangles at each angle and 1 at the center), and 12 remaining triangles have varying color.
2. Each triangle is drawn twice, once as a filled polygon and once as wireframe (the border). The edges are drawn in different color using another shader from a uniform attribute.
3. Both the pyramid and the rotating triangle will be translated when the ‘t’ key is hit. The moving mechanism is as described in the assignment, except for the dx value, which I have decreased it down to 0.0001 for each frame (for better visualization).
4. **PART D: EXTRA CREDIT**

For extra credit, I also implement these:

1. Use an IBO (with the help of opengl-turial part 9)
2. Translate the pyramid with mouse dragging event (see part C gif)
3. Change all triangles color (except for the first green triangle) when click outside the pyramid.
4. **DISCUSSION**

Some problems I ran into:

1. Using sizeof with dynamic array.
2. Passing wrong parameter to glDrawElements, the last parameter should be a pointer to the indices, instead of the start index of indices.
3. Wrong order of rotation and translation transformations.
4. and some issue with accessing out-of-bounds index in array.
5. **SOURCES**

* <http://www.opengl-tutorial.org/beginners-tutorials/tutorial-3-matrices/>
* <http://www.opengl-tutorial.org/intermediate-tutorials/tutorial-9-vbo-indexing/>
* <https://www.khronos.org/registry/OpenGL-Refpages/gl4/html/glDrawElements.xhtml>
* <https://stackoverflow.com/questions/37194845/using-glfw-to-capture-mouse-dragging-c> (mouse dragging handling)
* <https://www.glfw.org/docs/3.0/group__input.html#ga0192a232a41e4e82948217c8ba94fdfd> (GLFW key callback)