

**CMSC 427 Computer Graphics**  
**Programming Assignment 2: 2D World**  
**Version: Oct. 13, 2014**  
**Due Date: Sunday, Oct. 26, 2014 @ 9PM**  
**Project Submission:**

**Please email a zip file to the TA at [jgbrad1\(at\)cs.umd.edu](mailto:jgbrad1(at)cs.umd.edu) before the due date. Read below for further instructions on what must be included.**

**Project Description**

This assignment is designed to test your understanding of Barycentric coordinates and 2D transformations. There will not be much OpenGL programming required for this assignment.

**Code Requirements**

The starter code provides some code with a triangle that moves with some velocity off the image area. We will show in class how your implementation should work. Try to replicate this as close as possible.

Triangles are represented in 3D with each vertex assigned an (x,y,z) coordinate. Since we will only focus on the 2D plane, you should assume that all  $z=1$  is fixed so that all triangles are guaranteed to be in the same plane. Your code should perform in the following manner:

1. Triangles should be equilateral and there should be at least 50 triangles on the screen at any one time.
2. Triangles should rotate at some constant angular velocity.
3. Each triangle should have a solid color.
4. Clicking on a triangle should result in the triangle changing color and its size getting scaled up by 2. The triangle should continue to rotate after clicking.
5. Clicked triangles should be draggable. Upon release of the mouse, the triangle should continue with its old velocity.
6. Triangles should deflect (bounce) off the edge of the viewing area (i.e. no triangle should go outside of the viewing window)
7. Triangles should bounce off one another (i.e. no triangle should "pass over" another triangle).
8. Triangles should move at constant velocity.

**Extra Comments About the Project**

- All triangles should start with the same initial velocity. It is your choice what that velocity is, as long as it is *reasonable*.
- If a triangle has been clicked, the size and color of all **other** triangles should not change.
- At no point should a triangle overlap with another triangle.
- If you decide to use any C++11 features, include the following line in your `cmssc427.pro` file or else it will not compile on other platforms. If you don't know whether or not you're using C++11, you likely do not need to worry about this.

CONFIG += c++11

**Project Submission:**

A zip file containing **only** the following should be sent in an email to the TA. The .zip file should be named as follows: `YourFirstName_YourLastName.zip`

`GLview.cpp` (your implementation will be here, you may not add any more files)  
`GLview.hpp` (you may add function declarations/implementations here as needed)  
`cmssc427.cpp`  
`cmssc427.hpp`

cmssc427.pro  
cmssc427.ui  
resources.qrc  
simple.fsh  
simple.vsh

Although you may compile and run your program from within Qt Creator for development purposes, it must be able to be compiled from the command line using qmake followed by make (or nmake on windows).

### **Project Grading**

Your program will be graded based on correctness of implementation. Your code must be well commented. Note that it will also be judged subjectively based on the simplicity and clarity of implementation. An implementation that is easy to understand, but has few minor bugs will be scored higher than a messy implementation with the same number of minor bugs.

Points for this project are distributed as follows:

- Clicking a triangle changes its size and color (25%)
- Triangles rotate and move at constant velocity (15%)
- Triangles are draggable and scale in size and change color on dragging (20%)
- Triangles bounce off the edge of the window (10%)
- Triangles do not overlap each other and deflect off of each other (25%)
- Clean implementation (5%)