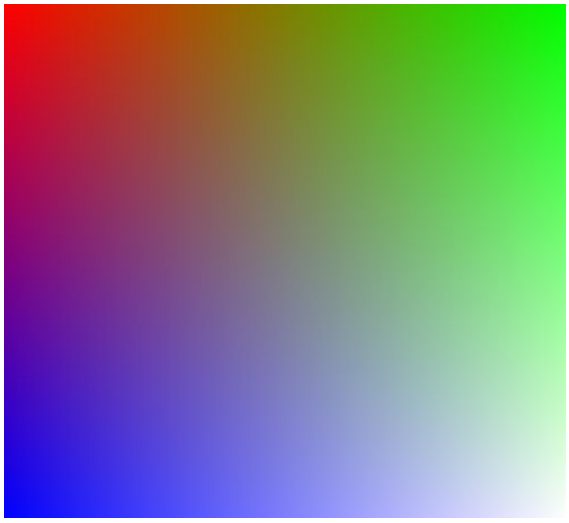
CSC 370: Programming Assignment 1
Interpolation

The goal of this assignment is to study how interpolation is used to color, blend, and shade primitives in the graphics pipeline. We'll use CImg to write code that performs all the necessary computations to draw and fill shapes. Then we will look at how to write code to use OpenGL to perform the same tasks.

Part A: Smooth Coloring - Square **(25 pts)**
Using CImg, write a program that constructs a square image and assigns a color to each corner. Using linear interpolation, fill in and color each pixel in the square so that there is a smooth coloring across the entire area of the square as shown below:



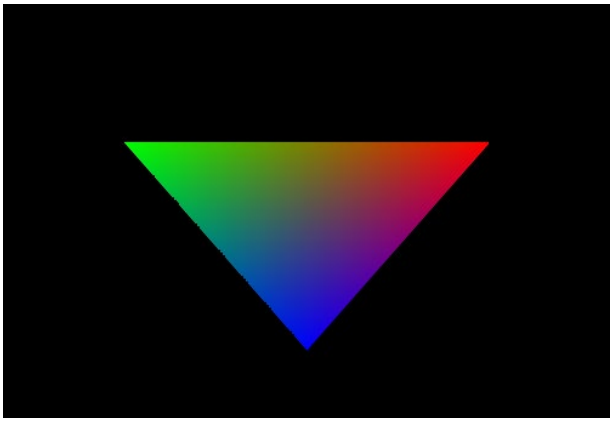
Your program should display the interpolated image.

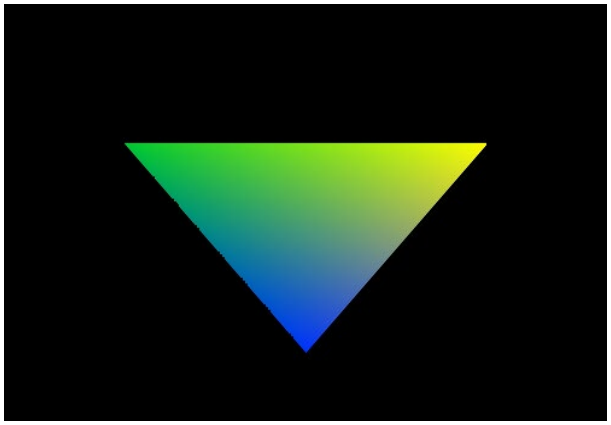
Part B: Smooth Coloring – Triangle **(50 pts)**
Using CImg, write a program that constructs an image and draw a triangle colored by interpolation. Create an image that's 500x500 pixels. Draw a triangle whose vertices are at (100,100), (400, 150), and (200, 300). You can also try out other vertex combinations.

Use the mid-point algorithm to draw the edges of the triangle. Color the edges using linear interpolation.

Fill in the area of the triangle by scanning each row of the image to identify which pixels are within the triangle. Color these pixels using Barycentric coordinates. The area of a triangle with 3 vertices A, B, and C is:

$$\text{Area} = \left| \left[A_x (B_y - C_y) + B_x (C_y - A_y) + C_x (A_y - B_y) \right] / 2 \right|$$





Your program should display the interpolated triangle.

Part C: Smooth Coloring – OpenGL **(10 pts)**
Try out the Hello Triangle OpenGL program that's under the Resources section on Canvas. Change the program to draw 3 different non-overlapping triangles (whatever locations you want as long as they are visible). Each vertex of each triangle should have a different color (for 9 colors total).

Part D: Report **(15 pts)**
Write a 3+ page report (including images) detailing your understanding of interpolation, how you completed the programs, any issues you encountered, and results. For Parts A and B, include at least 2 results using different anchor colors. Save your report as PDF to submit.