COMP-3500 - Project
100 Marks

Handed out: Thu. Nov. 05, 2020   **Due: Tue. Dec. 01, 2020**

We have talked about images and related terminology in class. This project is based on your understanding of some of these concepts and programming skills that you may have acquired in your studies in this or any other program.

This project will provide you an opportunity to explore and work with some of the most popular image file formats, implement a fairly easy image filter and present and observe its effects on various images with diverse contents. Image filters (also called masks) are used to create some interesting effects on a given image. Some of the common examples of image filters include:

- lens correction
- sharpening an image
- noise removal from an image
- changing image colors
- creating artistic effects

Image filters are applied to and affect one pixel at a time, but the results are usually a combination of multiple pixels or the entire image. Later in one of the labs, you will be exploring different image filters to enhance image or to create various interesting effects.

Filter specifications:
The filter you need to implement in this project is quite simple and straightforward. You need to read the entire set of scanline data for a given image format (more on it later). Once read, you need to divide the image consisting of X scanlines into smaller groups, each group consisting of N scanlines. As an example, if X = 100 and N = 5, then there will be X/N=20 groups listed as X1, X2, …, X20 such that each group will consist of 5 scanlines. Once read, you need to write it back in a file in the same format as that of the original image such that the odd number group X1 will be with the even number scanline group X2, X3 with X4 and so on and written in the file in this order.

What needs to be done?
You have been given images in three most common and popular formats, namely, **jpg, gif** and **png**. All of the images may not necessarily have the identical resolution and dimensions. There are total of five different images, each with 3 variants to include an image in one of the three above mentioned formats. You should write a program to read the pixel data for each of the image in a given format; apply the filter; and save it back in the same format in which you read it.

Images (image1.* – image5.*) can be downloaded from the Blackboard site as a single zip file where * in place of extension in image name above implies it to be jpg, gif or png.

Implementation:
Preferred programming language for implementation is Java since its graphics capabilities allow you to access various image management functions directly. However, you are allowed to use C++ or C# instead as well. You can download image libraries (such as Open GL) to access various graphic file manipulation operations from the web.

Program should have a modular design in which each type of image file format should be dealt by an independent module. Program should **prompt the user to enter the input and output file names and the integer number to indicate size of group**. Based on the

extension of the input file (lower case or upper case or a combination of the lower and upper case alphabets), program should decide which module should be invoked to do the required task.

Important:

1. This is an individual project. Each one of you is required to work independently without any collaboration with others. Each individual is responsible to maintain integrity of their work. Incidents of collaborative work will be dealt strictly. In all suspected instances of collaboration, **ALL** individuals involved will get zero marks for the project. This will be irrespective of who collaborated with whom. In other words, you are required to protect your work. In addition, the instructor will start formal process for integrity violations as per senate rules. Please note that SafeAssign will be used on your submission.

2. You are not allowed to use any graphic or image manipulation program (such as PhotoShop, GIMP, etc.) to convert output images from one format to another. In other words, you should not create the resultant image in one format only and then save it in other formats using any of the image/graphic application software. All of the work **MUST** be done through your application.

What to submit:

- Submit your project through Blackboard in relevant section on or before the deadline (Dec. 01, 2020 @ 05:00 PM). Late submissions will automatically lose 20% per late day, including each weekend day. There will be a 20% penalty even if it is submitted after time on the due date.

  The project submission should include the followings:

  - Complete documentation. Documentation consists of the followings:
    - Neatly typed complete description of the design methodology.
    - Neatly typed list of resources used, including web-based resources. For web resources, please provide complete URL of the site.
    - Instructions on how to compile and use your source.
    - A complete <u>well documented</u> source code with your name, student ID, course number appearing at the top of the source as a header of the program.
    - Output images obtained after application of your filter.
  - Name your source, class, html file, etc. as **your-name_project.xxx**
  - Any left-out details will be provided later in class.

Bonus (25%)
Give user a choice to apply filter either horizontally (i.e., on scanline) or vertically (i.e., on group of columns across the width of the image). Through your program/application, the user should be given an option to both choose the direction and to enter an integer number to indicate the size of the group (of scanlines or columns) to apply the filter.

If you decide to do this bonus, please clearly indicate in your submission, and additionally, and also provide clearly marked sample output images produced as part of your submission.