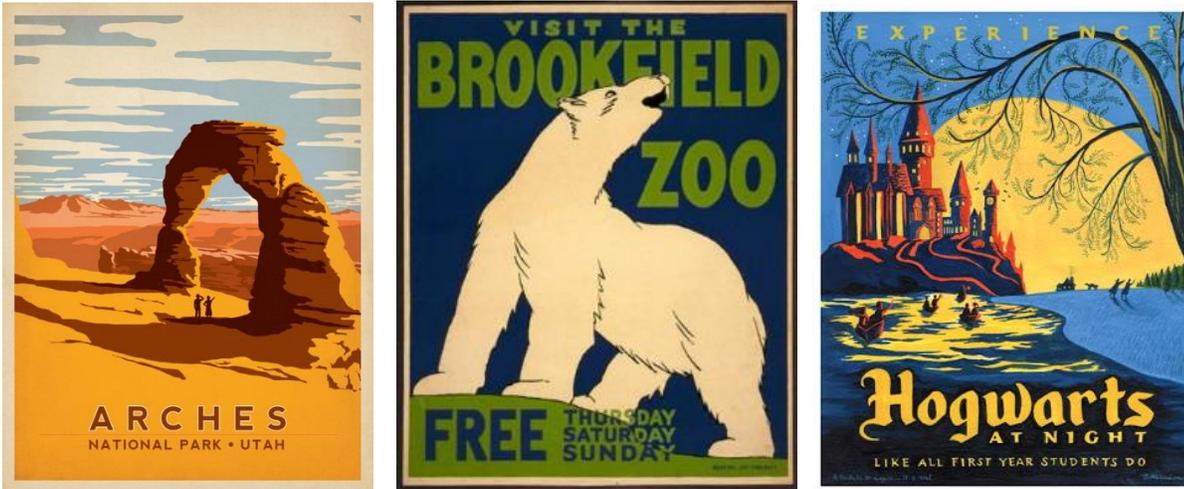# CS 111 – Program Design I, Spring 2018

Lab 7 - Posterization

Posterization is a technique that reduces the number of colors used in a picture. The term comes from when travel and movie posters (ads) were made using just a few number of colors. Today, the same process is used with silk-screening t-shirts. Below are a few examples of these old time posters:

The code to posterize is often a modification of the black & white (grayScale) code. Once the "grayAmount" has been determined for a pixel, we use that value in if statement(s) to determine which of the posterized colors that pixel will be set. The following shows that code for posterizing into 2 colors: black and white.

- If the grayAmount is in the range from 0 to 127, the color of the pixel becomes black.
- If the gray Amount is in the range from 128 to 255, the color of the pixel becomes white.

```
// determine the grayAmount from the color at the pixel
grayAmount = (red * 0.299 + green * 0.587 + blue * 0.114)

// determine the final color value of the pixel
if ( grayAmount < 128 ):
    // set the pixel to black
    red = 0
    green = 0
    blue = 0
else:
    // set the pixel to white
    red = 255
    green = 255
    blue = 255
```

To posterize to more colors we just need to use nested if statements (often called "elif" clauses). The following posterizes to 4 colors (black, blue, green and white). In this one the ranges for the grayAmount are:

- 0 - 63 for black,

- 64 - 127 for blue,
- 128 - 191 for green, and
- 192 - 255 for white.

```
// determine the grayAmount from the color at the pixel
grayAmount = (red * 0.299 + green * 0.587 + blue * 0.114)

// determine the final color value of the pixel
if ( grayAmount < 64 ):
   // set the pixel to black
   red = 0
   green = 0
   blue = 0
elif ( grayAmount < 128 ):
   // set the pixel to blue
   red = 0
   green = 0
   blue = 255
elif ( grayAmount < 192 ):
   // set the pixel to green
   red = 0
   green = 255
   blue = 0
else:
   // set the pixel to white
   red = 255
   green = 255
   blue = 255
```

Lab Assignment

Due: Wednesday 3/7/2018 by 11:59 pm

For this lab assignment, you are to posterize a picture into 6 colors. We will use the "grayAmount" that was used when creating a black and white (grayscale) picture to determine which of the six color values will be used.

The lab must be submitted electronically to the Assignment Link for Lab 7 inside of Blackboard. You will only need to submit the python source code file (the ".py" file).   The file is to be named using both your NetId and the name of the lab.   So if your net-id is ptroy4, the file containing Lab 7 should be named:

ptroy4lab7.py

Since the range for the "grayAmount" can vary from 0 to 255, we need to divide that range into 6 parts to distribute the six colors evenly throughout the picture. Thus in each range will have about 42 values in it (as 255 / 6 => 42).

We will use the following shades of green for our 6 colors. The names come from the web page at: http://www.tayloredmktg.com/rgb/.

- Olive Drab
- Forest Green
- Lime Green
- Lawn Green
- Spring Green
- Pale Green

grayAmount Range	0 - 42	43 - 84	85 - 127	128 - 170	171 - 212	213 - 255
Color Value	Olive Drab r = 107 g = 142 b = 35	Forest Green r = 34 g = 139 b = 34	Lime Green r = 50 g = 205 b = 50	Lawn Green r = 124 g = 252 b = 0	Spring Green r = 0 g = 255 b = 127	Pale Green r = 152 g = 251 b = 152

For this lab assignment, you are to write a python function named **main( )** that will complete the following:

1. Prompt the user for a picture and open that picture.
2. Call a second function that will posterize the picture as described above. The picture opened in step 1 is sent to as a parameter to this function.
3. Display the posterized picture.
4. You must write your programs using good programming style which includes:
   - Good variable names
   - in-line commenting
   - header block commenting for the program and each method written
     Be sure to include the following with the header block comment for the program.
     - your name
     - day and time of your CS 101 lab section (i.e. Wednesday at 9:00)
     - A description of the project.
   - proper indentation of program statements
   - use of blank lines to separate blocks of code.

Submission of the Lab

The lab must be submitted electronically to the Assignment Link for Lab 7 inside of Blackboard.

Example of the Program

The original beach picture and the posterized version as required by this lab are as follows: