Exam 2 – Programming Lab

CSC/DSCI 1301 – Principles of CS/DS I

Monday, March 18th, 2024

Lab Exam Policy

This is a closed book exam! You may only have your cheat sheet and your IDE open. You may not use a internet browser to research the solution. There is only 1 programming question. Please read the question carefully. You will have 1 hour and 40 minutes to complete this exam. Note: Please leave time to submit your code on iCollege. The iCollege submission window will close sharply at the end of the lab session.

Section	Grade	Points
Programming		40
Total		**40**

Deliverables

For this exam you will need to submit the python file containing your code to the iCollege assignment by the end of the lab. Please name your files as follows:

- Python Files
  - lastname_firstname_filename.py
  - For example: **hawamdeh_faris_rgb_to_cmyk.py**

Program: rgb_to_cmyk.py

The most common color model used by computer displays to represent images is the RGB color model. The RGB color model is an additive color model in which the red, green and blue primary colors of light are added together to reproduce the other colors in the spectrum. The abbreviation comes from the first letters of each of the primary colors: Red, Green, and Blue.

Colors in the RGB model are represented by a composition of 3 values: R, G, and B. Each primary color value can range between 0-255. This value represents the intensity of the primary color. Red is represented by an RGB value of (255, 0, 0) where only the red primary color is represented. Green is (0, 255, 0) and Blue is (0, 0, 255). All other colors are compositions of these 3 colors. For example, Yellow is created when Red and Green are combined. It is similarly represented in the RGB color model: (255, 255, 0).

However, if you have ever changed the ink on a color printer, you may have noticed that ink cartridges do not come in red, green, and blue inks. This is because color printers use a different color model to represent its images. Color printing uses a subtractive color model called the CMYK color model. The abbreviation refers to the names of the four ink colors: Cyan, Magenta, Yellow, and Key (Black). The values of each of the four ink colors range from 0(%) to 100(%).

Behind the scenes, your computer performs a color model conversion before printing a color document or picture to translate the RGB image you see on screen into the CMYK equivalent that your color printer can print. The formulas for converting the pixels of any RGB image into a CMYK pixel are shown below.

$$R' = \frac{R}{255}, \qquad G' = \frac{G}{255}, \qquad B' = \frac{B}{255}$$

$$K' = 1 - \max(R', G', B')$$

$$C = \frac{(1 - R' - K')}{(1 - K')} * 100$$

$$M = \frac{(1 - G' - K')}{(1 - K')} * 100$$

$$Y = \frac{(1 - B' - K')}{(1 - K')} * 100$$

$$K = K' * 100$$

For this exam, you will need to program a function called **RGB_to_CMYK()** that takes a dictionary of RGB values as input, converts them from RGB to CMYK, and returns a dictionary of the equivalent CMYK value. The keys of the RGB dictionaries are R, G, and B with values ranging from 0-255. The keys of the CMYK dictionaries are C, M, Y, K with values ranging from 0 -100. **Note: CMYK values are always integers.**

Your program should allow the user to enter multiple R, G, and B values as input until a stop word is detected, compute the conversion to CMYK using the function, and output the C, M, Y, and K values in the terminal. There should be at least two valid stop words, one of which should be a single letter shortcut. Ex. 'quit' and 'q'.

Example Output

```
RGB To CMYK Converter
Enter the Red Color Value: 0
Enter the Green Color Value: 128
Enter the Blue Color Value: 128

CMYK Values
Cyan: 100
Magenta: 0
Yellow: 0
Key (Black): 49
```