EE568 – Digital Image Processing, Winter 2021

Assignment 1

**Due: 8:30** **am Tuesday 1/12/2021, before the lecture begins.**

***Note: Please follow the homework submission guidelines on the class webpage.***

1. Image processing and commercial tools **(15 points)**

* + - * 1. Capture a digital color image of yourself and enlarge it by a factor of 2.5 in both horizontal and vertical dimensions using an image editing tool. Put the original and enlarged images in your report.
        2. Adjust **1\_1.jpg** (e.g. brightness, contrast …) until you find it most pleasant. Put the adjusted image in your report.

***HINT:*** You could use any software you have (e.g. Adobe Photoshop, Paint/Photos in Windows).

1. Image I/O and data types. **(15 points)**
   1. Load the Lena image **1\_2.bmp**, using MATALB: imread() or Python: cv2.imread(), and show it using MATLAB: imshow() or Python: cv2.imshow().
   2. Get the type of the loaded image data (Use MATLAB function class(), or Python/Numpy array\_name.dtype), and get the maximum and the minimum data values for this image (Use MATLAB function max() and min(); or Numpy np.amax() and np.amin()).
   3. Convert the data to the “double” type (use MATLAB function double() or Numpy astype(float)), can you show the double-typed image using MATLAB: imshow() or Python: cv2.imshow()?
   4. If not, given an image which has been converted to the “double” type, how do you show the image?

***HINT:*** MATLAB has an image value range for the default uint8 type in [0 255]. For imshow(), if the data type is double, it should be in the range [0 1]. Double type data can be converted to uint8 data, or data can be normalized to be in [0 1] for imshow().

To use Python, make sure numpy and opencv are installed, then import those two modules:



To display image using Python opencv, use:



1. Matlab/Python basics: Matlab/Python commands. **(20 points)**

Write a script to do the following.

* 1. Read **1\_3.tif** and its associated colormap into variables named “X” and “map”. Use “X” and “map” to convert the image to a 256-level grayscale image “Y”. (If you use python, you don’t need to get the “map” variable.)
  2. Rotate “Y” 120 degrees clockwise to generate image “Z0”.
  3. Rotate “Y” 10 degrees clockwise 12 times to generate image “Z1”.
  4. Can you observe any differences between image “Z0” and “Z1”?
  5. Submit images Y, Z0 and Z1, and the script you wrote.

***HINT:***

Use the Matlab commands: [X,map]=imread( ‘1\_3.tif', 'tif' ) , imshow(X, map) , ind2gray, imrotate.

For Python/Opencv, X=cv2.imread(‘1\_3.tif’). To convert a color image to a grayscale image, you can use cv2.cvtColor(X, cv2.COLOR\_BGR2GRAY), which returns the grayscale image. Please note that cv2.imread function returns the color image in BGR(blue, green and red) order instead of RGB.

To rotate an image, use the function below:

