

CCPS109 Assignment

Due: April 18th @ 23:00hr

20%

May work in group of 2.

Due to time constraints only lateness of less than 24hours will be accepted with 30% deduction. Greater than 24hours will receive Zero

Data and Image analysis are among the fields that brought about Python's popularity. There are many tools that are available to accomplish these relating tasks. These tasks may be medical imaging analysis and diagnostic tools. However, with out understanding of the fundamentals it will be difficult to create meaningful programs. The goal of this program is for students to learn and become familiar with Numpy and Pillow. In particular to writing programme that manipulate data on the pixel level without heavy reliant packages. You are expected to independently learn how to use the few functions from Pillow.

Read the entire Assignment and visit tutorial links provided before attempting the assignment.

Your program will accept a JPEG image of any size for manipulation based on user selection and input. Provide user with options with what to do with the images: Mirror/reflection, threshold, saving file. Programme run continuously until user quit with 'q'

-Have your program read an image (have it hard coded to 'testimage.jpg' which is in the same directory as the code).

!n: for your own testing (print out the array to see)

-display the image along with it's width, height, and mode

-turn the image into grayscale using function from Pillow.

!n: for your own testing (print out the array to see)

Reflection:

Write a function that create a reflection of the gray scale image based on the percentile input by the user. The reflection example below is 33 percent vertically. Reflection is simply the mirroring of the values of each pixel along the specified axis.

2	1	0	9	9	1
7	0	7	3	1	9
6	2	1	7	1	0
5	7	0	3	7	1

5	7	0	3	7	1
6	2	1	7	1	0
7	0	7	3	1	9
2	1	0	9	9	1
6	0	6	7	0	8
4	0	8	9	2	2
1	1	5	3	4	8
0	7	9	4	7	3

Example of reflected array.

Reflection is done on an index by index manipulation or rows and columns slicing:
Cannot use Pillow or other library functions.

The user is provided options to reflect vertical(v) or horizontally (h).

Limit reflection percentage to <=50

Return numpy array of modified image

Show the new reflected image via a function.

Optional challenge: reflection in full RGB.

Threshold: a very simple but power techniques used for image processing.

A function that takes a unmodified grayscale image and change the value of the image to either 0 or 255 based on the user input threshold value.

Pixel value less than or equal to threshold => pixel value become 0

Pixel value greater than threshold=> pixel value become 255

Return numpy array of modified image

File Ouput:

Provide user with options to save or not to save augmented images

(reflection.jpg and threshold.jpg).

Create one function responsible for writing numpy data as image file.



Original



Reflection V 33%



Threshold

I am using Lenna as to keep with tradition for the standard test image use in Image Processing.

The input test file will be call 'testimage.jpg', while the image will be of my choosing.

Restriction:

Only have numpy and PIL as import. No other Library is allowed

Submission:

Submit file: 'ccps109assignment.py'

Only one member submit the assignment: or else MOSS will note as plagiarized work

Must include both members' name and Student ID as comment on top, or else it will consider independent work.

Image Tutorial: Each JPEG image is composed of 3xNxM arrays.

Each pixel in an image is composed of 3 channels (Red, Green, Blue) values ranging from 0-to 255: See the 2 figures bellow.

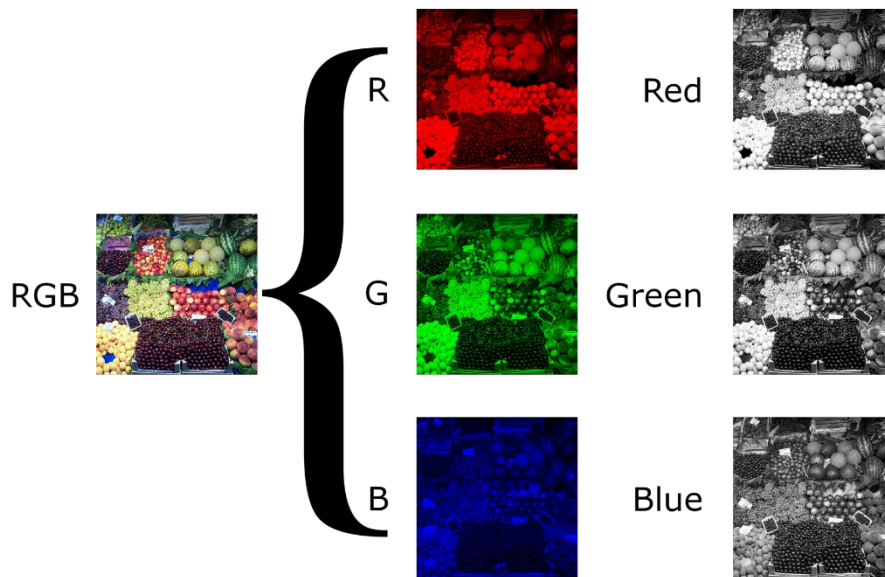
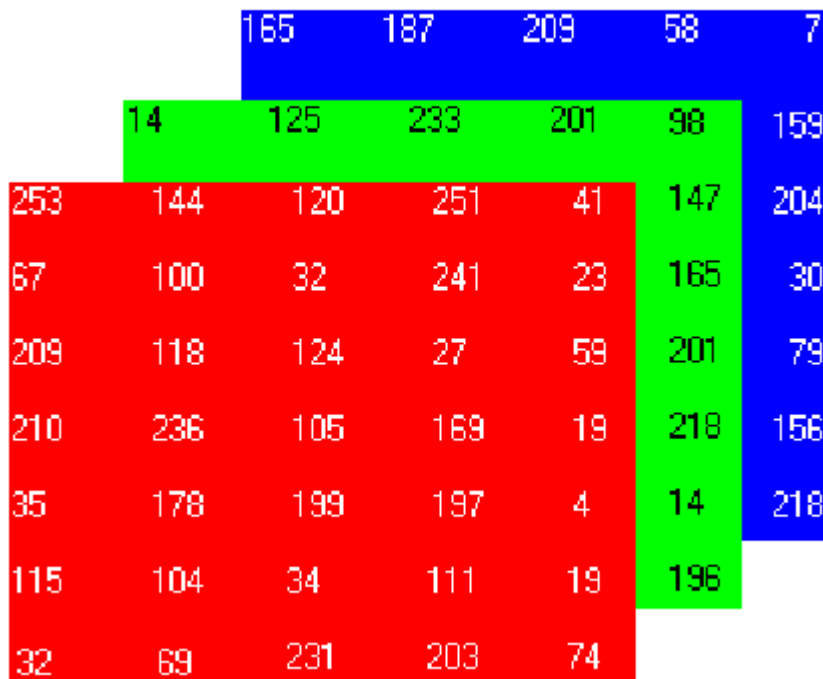


Figure from: <https://en.wikipedia.org/wiki/Grayscale>



At position (0,0) the RGB value is (253,14,165)

Resources:

<https://pythonexamples.org/python-pillow/>

Installing Pillow:

<https://pillow.readthedocs.io/en/latest/installation.html#>

Installing Numpy instruction:

See link from lecture

Pillow Tutorial:

<https://pillow.readthedocs.io/en/latest/handbook/tutorial.html>

image to numpy:

<https://www.pluralsight.com/guides/importing-image-data-into-numpy-arrays>

<https://www.w3resource.com/python-exercises/numpy/python-numpy-exercise-108.php>

<https://pythoninformer.com/python-libraries/numpy/numpy-and-images/>

<https://pythoninformer.com/python-libraries/pillow/image-manipulation-recipes/>

<https://pythoninformer.com/python-libraries/numpy/index-and-slice/>