Lab sheet 1
Lab-1 Familiarization to Image Processing using Python

Srikant Nayak
(SC18M005)

Sub: Image and Video Processing Lab **Department**: Mathematics(M.Tech)
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Question 1:

Write a Python program to:

(a) Find the largest and smallest element in a matrix and print the values along with their postion.

(b) Input two arrays and output the common values between the two.

(c) Do elementwise addition, subtraction, multiplication and division with and without built-in functions.

(d) Starting with any uniform signal, do the repeated convolutions to itself and illustrate central limit theorem

Discussion

The **Aim** of the above programs is to get familiar with builtin functions in *python* as well as conventional programming. These programs forms the basic idea on logic building, working with matrices and operations on matrices.

Result

Output of Program (a)
runfile('I:/spyder/untitled0.py', wdir='I:/spyder')
maximum element of given matrix - 7
index of maximum element - 1 4
minimum element of given matrix - 1
index of minimum element - 0 0

Output of Program (b) runfile('I:/spyder/1(b).py', wdir='I:/spyder')
These are common elements of the given two arrays-[3, 4, 5]

Output of Program (c) runfile('I:/spyder/1(c).py', wdir='I:/spyder')

number of element in array:2

input 1 element of first array 22

input 2 element of first array 22

input 1 element of second array 33

input 2 element of second array 2

array is: [22, 22]

array is: [33, 2]
element wise addition of array 1 and 2 is- [55, 24]

element wise substraction of array 1 and 2 is- [-11, 20]

element wise multiplication of array 1 and 2 is- [726, 44]

element wise division of array 1 and 2 is- [0.6666666666666666, 11.0]

Output of Program (d)

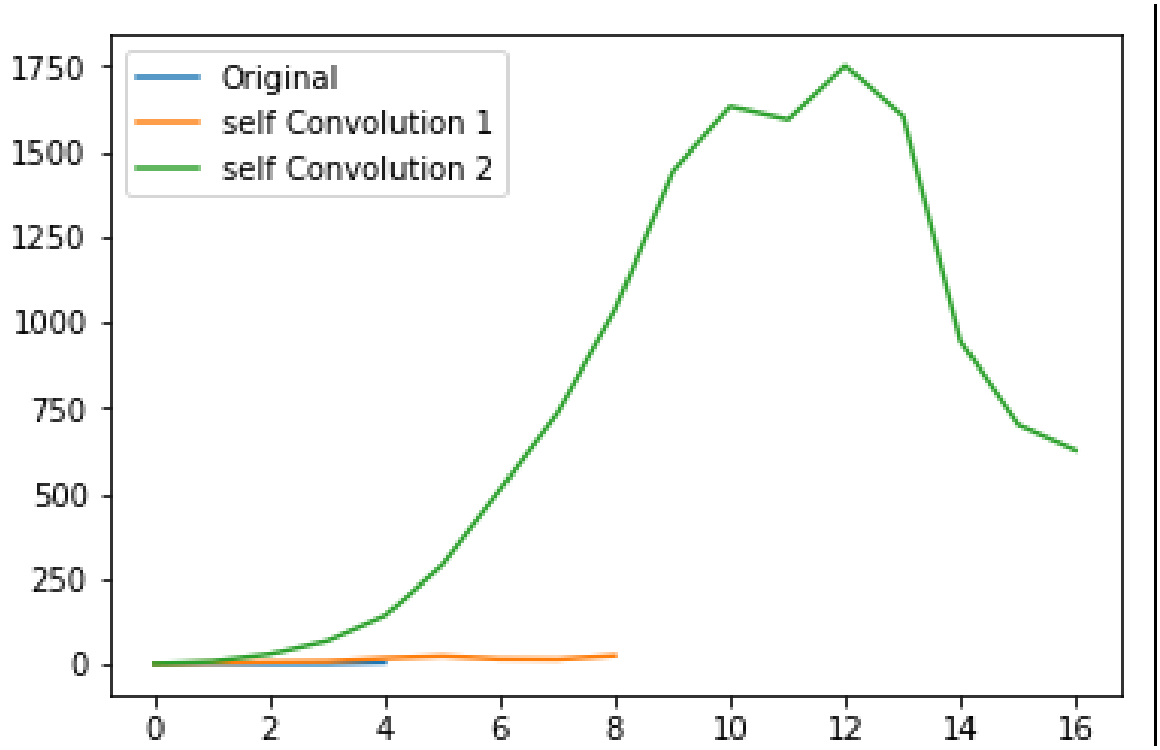

Figure 1: Convolution to illustrate Central limit theorem

Inference

(a) The program takes two matrices of same size as input and gives output the largest and smallest element along with their row and column index.

(b) The program takes two arrays as of size n as input and prints the common values between the two matrices.

(c) The program gives output as a result of element wise addition,substraction,multiplication and division for given two matrices.

(d) The program takes a signal as input does repeated convolutions to itself and illustrates central limit theorem

Question 2:

Read,display and save the lenna.jpg image to another format. Also display the image format,size,mode and information of the original image using built in commands.

Discussion

The **Aim** of the above program is to get familiar about basic image processing using PIL package in *Python*

Result

Output of the program:

```
Image in array form -
[[[221 154 125]
  [221 154 125]
  [219 152 123]
  ...
  [244 171 120]
  [236 154 104]
  [196 110  59]]

 [[224 155 126]
  [223 154 123]
  [222 153 122]
  ...
  [235 163 115]
  [224 148  99]
  [188 107  60]]

 [[225 154 122]
  [224 153 121]
  [223 152 120]
  ...
  [242 175 132]
  [229 162 119]
  [194 125  83]]

 ...

 [[ 29  19  17]
  [ 32  23  18]
  [ 35  28  20]
  ...
  [144  76  53]
  [143  68  45]
  [145  69  45]]

 [[ 27  17  15]
  [ 32  23  18]
  [ 36  29  21]
  ...
  [152  80  58]
```

```
  [152  74  51]
  [157  75  53]]

 [[ 25  15  13]
  [ 31  21  19]
  [ 36  29  21]
  ...
  [157  80  60]
  [161  79  57]
  [166  82  58]]]
mode of image : RGB
size of image: (400, 400)
format of image: JPEG
```

Inference

In this program certain some command were used such as its size, mode, format. The matrix form of the image was formed and the image was saved in another format.

Question 3:

Familiarize the following basic commands in PIL:

(a) crop,paste

(b) split,merge

(c) resize,rotate,transpose

(d) blend

(e) convert,copy

(f) getbands,getextrema,getpixel,putpixel

Discussion

The **Aim** of the above program is to get familiar about basic image processing using PIL package in *Python*. Using the above commands we can apply basic image transformations and editing. we use Image module in PIL package of *python* for the above methods.

(i) *Image.crop()* - Returns a rectangular region from given image.

(ii) *Image.paste()* - Pastes another image into given image.

(iii) *Image.split()* - Splits given image into individual bands.

(iv) *Image.merge()* - Merge a set of single band images into a new multiband image.

(v) *Image.resize()* - Returns a resized copy of given image.

(vi) *Image.rotate()* - Returns a rotated copy of given image, rotated the given number of degrees counter-clockwise around its centre.

(vii) *Image.transpose()* - Transforms the given image.

(viii) *Image.blend()* - Creates a new image by interpolating between two input images.

(ix) *Image.convert()* - Returns a converted copy of given image.

(x) *Image.copy()* - Copies given image to another and retains the original.

(xi) *Image.getbands()* - Returns a tuple containing the name of each band in given image. For example, getbands on an RGB image returns (R, G, B).

(xii) *Image.getextrema()* - Gets the the minimum and maximum pixel values for each band in the image.

(xiii) *Image.getpixel()* - Returns the pixel value at a given position.

(xiv) *Image.putpixel()* - Modifies the pixel at the given position.

Result

```
Image bands of lenna.jpg ('R', 'G', 'B')
Extremas of lenna.jpg ((0, 255), (0, 255), (0, 255))
Value of pixel at location 250,250 in lenna.jpg (212, 160, 136)
```

Inference

(a) crop and paste commands are used to crop the image and paste the image.
(b) split and merge commands are used to split the image into different R,G,B colour bands and merge the different bands into a single image. (c) resize, rotate, transpose commands are used to resize the image from one resolution to another, rotate the image in specified angle and transpose the image.
(d) blend command is used to superimpose one picture onto another hence it blends the source image and target image.
(e) convert, copy commands are used to convert the image from one format to another and to save an identical copy of the given image respectively
(f) getbands, getextrema, getpixel, putpixel commands are used to work on details of the image element (pixel) to get the color bands, get the extereme element, get specific pixel, change the color to a pixel respectively.