
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY

NAGPUR

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Roll.No	:	BT19ECE061
Course	:	Digital Image Processing
Instructor	:	Dr.Tapan Jain

Assignment-1

Aim:

Task1–Read a color image and convert it into gray scale image without using inbuilt function(i.e do it by average method($(R+G+B)/3$)).

Task2–Convert the pixel of gray scale image to either 1 or 0.

Task3–Add gray image and image with pixels either 1 or 0 and add 20 to gray scale image. Performe the task and display the output images.

Results:

Code:

```
#####-----Read a color image and convert
it into gray scale image without using inbuilt function(i.
e do it by average method( $(R+G+B)/3$ )).
Convert the pixel of gray scale image to either 1 or 0.
Add gray image and image with pixels either 1 or 0 and add
20 to gray scale image.
#Performe the task and display the output images.
#####
import math
import numpy as np
import cv2
image = cv2.imread( 'wp2599594.jpg ' )
m,n,v = image.shape
gray_image = np.zeros((m,n),np.uint8)
```

```

image_onezeroes = np.zeros((m,n),np.uint8)
image_onezeroes2 = np.zeros((m,n),np.uint8)
print(m,n,v)
dummy = 0
for i in range(m):
    for j in range(n):
        for k in range(v):
            dummy = dummy + image[i][j][k]
            gray_image[i][j] = math.floor(dummy/3)
            dummy = 0
for t in range(m):
    for u in range(n):
        image_onezeroes[t][u] = (gray_image[t][u])/255
for v in range(m):
    for w in range(n):
        if(gray_image[v][w] >= 128):
            image_onezeroes2[v][w] = 1
        else:
            image_onezeroes2[v][w] = 0
print("color image pixels")
print(image)
print("gray image pixels")
print(gray_image)
print("one/zero image pixels")
print(image_onezeroes)
print("one/zero image2 pixels")
print(image_onezeroes2)

cv2.imshow("original",image)
cv2.waitKey(0)
cv2.imshow('gray',gray_image)
cv2.waitKey(0)
cv2.imshow('zerosones',image_onezeroes)
cv2.waitKey(0)
cv2.imshow('zerosones2',image_onezeroes2)
cv2.waitKey(0)
cv2.imshow('grayimage + zerosoneimage',gray_image +
            image_onezeroes)
cv2.waitKey(0)

```

```
cv2.imshow( 'grayimage + zerosoneimage2 ',gray_image +  
            image_onezeroes2)  
cv2.waitKey(0)  
cv2.imshow( 'grayimage + 20 ',gray_image + 20)  
cv2.waitKey(0)  
cv2.destroyAllWindows()
```

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Assignment-2

Aim:

Read a color image, convert the color image to gray scale and display both images.
Read a color image, convert the color image to gray scale and display both images.

Results:

Code:

```
#####-----Read a color image, convert the  
color image to gray scale and display both images.  
Read a color image, convert the color image to gray scale and  
display both images.  
#####  
import math  
import numpy as np  
import cv2  
pic = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\  
PYTHONFILES\DIP\Virat-Kohli-2.jpg")  
a,b,c = pic.shape  
gray_img = np.zeros((a,b),np.uint8)  
gray_img2 = np.zeros((a,b),np.uint8)  
picture_onezeroes2 = np.zeros((a,b),np.uint8)  
print("dimensions of picture is {}x{}x{}".format(a,b,c))  
  
total = 0  
for i in range(a):
```

```
    for j in range(b):
        for k in range(c):
            total = total + pic[i][j][k]
        gray_img[i][j] = math.floor(total/3)
        total = 0

for x in range(a):
    for y in range(b):
        gray_img2[x][y] = gray_img[x][y]

for x in range(20,720,1):
    for y in range(300,980,1):
        gray_img2[x][y] = 0

cv2.imshow("original picture",pic)
cv2.waitKey(0)
cv2.imshow('Grayscale picture',gray_img)
cv2.waitKey(0)
cv2.imshow('Grayscale picture2',gray_img2)
cv2.waitKey(0)
cv2.imshow('Grayscale picture - Grayscale picture2',abs(
    gray_img - gray_img2))
cv2.waitKey(0)
```

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Assignment-3

Aim:

Create two images one with a white circle at center and another with a white rectangle at center and performe all logical gate operations on both images and display the output images

Results:

Code:

```
#####-----Create two images one with a  
white circle at center and another with a white rectangle  
at center and performe all logical gate operations on both  
images and display the output images.  
#####  
import math  
import numpy as np  
import cv2  
  
pic1 = np.zeros((512,512),np.uint8)  
pic2 = np.zeros((512,512),np.uint8)  
  
pic1 = cv2.circle(pic1,(235,250),80,(255,255),-1)  
pic2 = cv2.rectangle(pic2,(100,300),(330,190),(255,255,255),  
-1)
```

```
cv2.imshow("Image with white circle at center",pic1)
cv2.waitKey(0)
cv2.imshow("AND operation on images",cv2.bitwise_and(pic1 ,
    pic2))
cv2.waitKey(0)
cv2.imshow("NAND operation on images",cv2.bitwise_not(cv2.
    bitwise_and(pic1 , pic2)))
cv2.waitKey(0)
cv2.imshow("OR operation on images",cv2.bitwise_or(pic1 , pic2
    ))
cv2.waitKey(0)
cv2.imshow("NOR operation on images",cv2.bitwise_not(cv2.
    bitwise_or(pic1 , pic2)))
cv2.waitKey(0)
cv2.imshow("EXOR operation on images",cv2.bitwise_xor(pic1 ,
    pic2))
cv2.waitKey(0)
cv2.imshow("EXNOR operation on images",cv2.bitwise_not(cv2.
    bitwise_xor(pic1 , pic2)))
cv2.waitKey(0)
```

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Assignment-4

Aim:

Read a color image and display its reddish, greenish and bluish image

Results:

Code:

```
#####-----read a color image and display
its reddish , greenish and bluish image
-----#####
import cv2

image_original = cv2.imread(r"C:\Users\udayn\OneDrive\
Desktop\PYTHONFILES\DIP\Virat-Kohli-2.jpg")
img_red = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg")
img_green = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg")
img_blue = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg")

img_blue[:, :, 1], img_blue[:, :, 2] = 0, 0
img_green[:, :, 0], img_green[:, :, 2] = 0, 0
img_red[:, :, 0], img_red[:, :, 1] = 0, 0

cv2.imshow("Original Image", image_original)
```

```
cv2.waitKey(0)
cv2.imshow("Reddish Image",img_red)
cv2.waitKey(0)
cv2.imshow("Greenish Image",img_green)
cv2.waitKey(0)
cv2.imshow("Blueish Image",img_blue)
cv2.waitKey(0)
```

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Assignment-5

Aim:

Read a color image, convert the color image to gray scale and perform histogram equalization by algorithm discussed in class.

Results:

Code:

```
#####-----Read a color image, convert the
color image to gray scale and performe histogram
equalization by algorithm discussed in class.
#####
import math
import numpy as np
import matplotlib.pyplot as plt
import cv2

image = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg") #comment this for
wikipedia results
a,b,c= np.shape(image) #comment
this for wikipedia results

#grayscaleimage = np.array([[52,55,61,59,79,61,76,61],
#[62,59,55,104,94,85,59,71],
#[63,65,66,113,144,104,63,72],
```

```

#[64,70,70,126,154,109,71,69],
#[67,73,68,106,122,88,68,68],
#[68,79,60,70,77,66,58,75],
#[69,85,64,58,55,61,65,83],
#[70,87,69,68,65,73,78,90]], dtype=np.uint8)
#m,n = np.shape( grayscaleimage)
#grayscaleimage_1 = np.array([[52,55,61,59,79,61,76,61],
#[62,59,55,104,94,85,59,71],
#[63,65,66,113,144,104,63,72],
#[64,70,70,126,154,109,71,69],
#[67,73,68,106,122,88,68,68],
#[68,79,60,70,77,66,58,75],
#[69,85,64,58,55,61,65,83],
#[70,87,69,68,65,73,78,90]], dtype=np.uint8)

grayscaleimage = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    #comment this for wikipedia results
grayscaleimage_1 = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    #comment this for wikipedia results
unique_array = np.unique(grayscaleimage)
count_array = np.zeros(len(unique_array),int)
cdf_array = np.zeros(len(unique_array),int)
hv_array = np.zeros(len(unique_array),int)

for i in range(0,len(unique_array)):
    count_array[i] = np.count_nonzero(grayscaleimage ==
    unique_array[i])

cdf_array[0] = count_array[0]

for i in range(1,len(unique_array)):
    cdf_array[i] = cdf_array[i-1] + count_array[i]

cdf_min = min(cdf_array)

for i in range(0,len(unique_array)):
    hv_array[i] = round(((cdf_array[i] - cdf_min)*255)/((a*b
    ) - cdf_min))

for i in range(0,len(unique_array)):

```

```

    for j in range(a):
        for k in range(b):
            if( grayscaleimage_1[j][k] == unique_array[i]):
                grayscaleimage_1[j][k] = hv_array[i]
            else:
                continue

print("a x b x c = %d x %d x %d"%(a,b,c))                #
    comment this for wikipedia results
#print("a x b = %d x %d"%(a,b))

print("grayscaleimage =")
print(grayscaleimage)
print("unique_array =")
print(unique_array)
print("count_array =")
print(count_array)
print("cdf_array =")
print(cdf_array)
print("cdf_min = %d"%(cdf_min))
print("hv_array =")
print(hv_array)
print("grayscaleimage_1 =")
print(grayscaleimage_1)

cv2.imshow('Image before histogram equalization',
    grayscaleimage)
cv2.waitKey(0)
cv2.imshow('Image after histogram equalization with
    algorithm discussed in class',grayscaleimage_1)
cv2.waitKey(0)
cv2.imshow('Image after histogram equalization with direct
    function',cv2.equalizeHist(grayscaleimage))
cv2.waitKey(0)
cv2.destroyAllWindows()
plt.subplot(3,1,1)
plt.hist(grayscaleimage.ravel(),256,[0,256])
plt.subplot(3,1,2)
plt.hist(grayscaleimage_1.ravel(),256,[0,256])
plt.subplot(3,1,3)

```

```
plt.hist(cv2.equalizeHist(grayimage).ravel()  
        ,256,[0,256])  
plt.show()
```

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Assignment-6

Aim:

Read a color image, convert the color image to gray scale and do contrast manipulation.

Results:

Code:

```
#####-----Read a color image, convert the
color image to gray scale and do contrast manipulation.
#####
import math #
import the required libraries.
import numpy as np
import cv2
image = cv2.imread(r"C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg") #reading the
image.
grayscaleimage = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY) #
Converting it into grayscale.

#-----Contrast Manipulation-----
#to increase contrast we multiple image with a constant,
greater than one.
#to decrease contrast we multiple image with a constant,
lesser than one.
```

```
cv2.imshow("original Image", grayscaleimage)
cv2.waitKey(0)
cv2.imshow("increase contrast Image", grayscaleimage*1.1)
cv2.waitKey(0)
cv2.imshow("decrease contrast Image", grayscaleimage*0.0009)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

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Assignment-7

Aim:

To Perform Shannon Fano Coding

Results:

Code:

```
##### Shannon Fano Coding
#####
import math

p = input("Enter the comma separated list of probabilities")
    .split(",")
for i in range(0,len(p)):
    p[i] = float(p[i])
p.sort(reverse=True)
#print(p)
Code=[""]*len(p)
def next_stage(p, si=0,ei=len(p)):
    if(ei-si<=1):
        return
    elif(ei-si==2):
        Code[si]+='0'
        Code[si+1]+'1'
        return
    sum = 0
```

```

diff = []
for i in range(si , ei):
    sum+=p[i]
    sum2 = 0
    for j in range(i+1,ei ,1):
        sum2 = sum2 + p[j]
    sum2 = round(sum2,2)
    diff.append(round((sum - sum2) ,2))
diff=[abs(x) for x in diff]
index_2121 = diff.index(min(diff)) + si
for i in range(si , ei):
    if(i <= index_2121):
        Code[i] += "0"
    elif(i > index_2121):
        Code[i] += "1"
next_stage(p, si , index_2121+1)
next_stage(p, index_2121+1, ei)

next_stage(p,0 , len(p))
#print(Code)

H = 0
L = 0
for i in range(0 , len(p)):
    H = H + (p[i]*math.log((1/p[i]) ,2))
    L = L + (p[i]*len(Code[i]))
print("probabilities",end=" ")
print("Code")
for i in range(0 , len(p)):
    print(p[i] ,end=" ")
    print(Code[i])
print("Entropy is {}".format(round(H,2)))
print("Average CodeWord Length is {}".format(round(L,2)))
print("Efficiency is {}".format(round(((H/L)*100) ,2)))

```

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Assignment-8

Aim:

Read a color image and do contrast manipulation of the image

Results:

Code:

```
#####-----Read a color image and do
contrast manipulation of the image
-----#####
import math
import numpy as np
import cv2

image = cv2.imread(r'C:\Users\udayn\OneDrive\Desktop\
PYTHONFILES\DIP\Virat-Kohli-2.jpg')
                #Reading the image
a,b,c = image.shape

Increased_contrast = np.zeros(image.shape, image.dtype)
                # To display image of increased contrast then
original
Decreased_contrast = np.zeros(image.shape, image.dtype)
                # To display image of increased contrast then
original
```

```

High_Contrast_Control = 1.6    # control for High Contrast
Low_Contrast_Control = 0.7     # control for Low Contrast
Brightness_Control = 0         # brightness control

for y in range(image.shape[0]):
    for x in range(image.shape[1]):
        for c in range(image.shape[2]):
            Decreased_contrast[y,x,c] = np.clip(
Low_Contrast_Control*image[y,x,c] + Brightness_Control, 0,
255)
            Increased_contrast[y,x,c] = np.clip(
High_Contrast_Control*image[y,x,c] + Brightness_Control,
0, 255) #Clipping values out of range to into range

#Dispalying Images
cv2.imshow("Original Image",image)
cv2.waitKey(0)
cv2.imshow("Contrast Increased Image", Increased_contrast)
cv2.waitKey(0)
cv2.imshow("Contrast Decreased Image", Decreased_contrast)
cv2.waitKey(0)
cv2.destroyAllWindows()

```