CV Assignment – 1

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Write a program in your preferred programming language to rotate an image by some random angle between 0 to 270 degree. You can take greyscale image or color image. Note: Do not use direct command to rotate an image.

Use 2 x 2 or 3 x 3 transformation that is discussed in the class. Every student should have different image rotated by different angle. You have to comment your name and roll number in your code. Create asingle pdf file that includes code and results (original image and rotated image mentioning the angle or rotation.

Code=>

```
#U19CS009
#BRIJESH ROHIT

#Importing modules
import numpy as np
from PIL import Image
import math
#INPUTS
image= np.array(Image.open("mustang.jpg"))
angle=int(input("Enter the angle in degrees : "))
#FREQUENTLY USED VARIABLES
angle=math.radians(angle)
cos=math.cos(angle)
sin=math.sin(angle)
height=image.shape[0]
width=image.shape[1]
#|X|=| cos sin ||x|
#|Y|=|-sin cos ||y|
#on matrix multiplication
#X= x*cos + y*sin
#Y= -x*sin + y*cos
#shape of new rotated image
new_w=round(abs(width*cos)+abs(height*sin))+1
new_h=round(abs(height*cos)+abs(width*sin))+1
#empty image matrix
rot_img_mat=np.zeros((new_h,new_w,image.shape[2]))
#Center coordinate of original image matrix
center_x=round((width+1)/2)-1
center_y=round((height+1)/2)-1
#Center coordinated of rotated image matrix
new_center_x=round((new_w+1)/2)-1
new_center_y=round((new_h+1)/2)-1
for i in range(height):
    for j in range(width):
        #coordinate with respect to center of original image
        x=image.shape[1]-1-j-center_x
```

```
        y=image.shape[0]-1-i-center_y
        #coordinate of Rotated image
        new_x=(x*cos+y*sin)
        new_y=(-x*sin+y*cos)
        #coordinate with respect to center of rotated image
        new_x=int(new_center_x-new_x)
        new_y=int(new_center_y-new_y)
        #if the coordinate is a valid coordinate then copying original
        #images value.
        if 0<=new_x<new_w and 0<=new_y<new_h and new_h>=0 and new_w>=0:
            rot_img_mat[new_y,new_x,:]=image[i,j,:]

#Saving image
rot_img=Image.fromarray((rot_img_mat).astype(np.uint8))
rot_img.save("rotated_img.jpg")
```

Output:

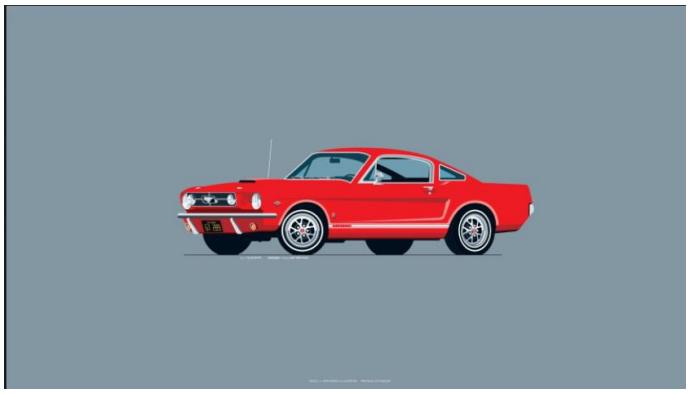

Image after rotation 35°: