EN2550 Excercise 03

Index No. : 190018V

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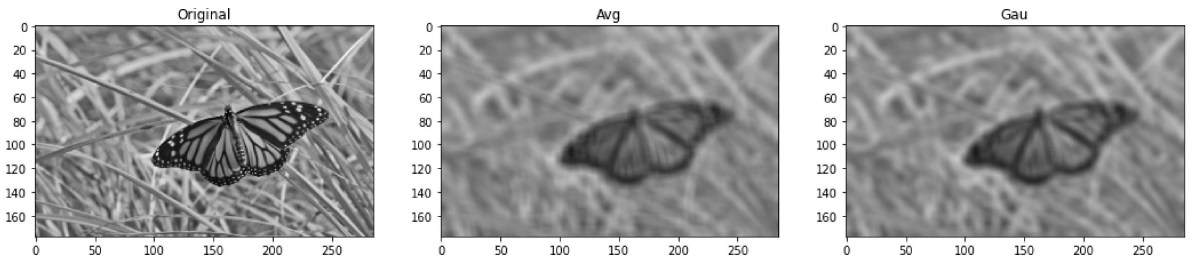
Github : https://github.com/KCSAbeywickrama/EN2550-Excercises

In [ ]:
```
# imports
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt
```

In [ ]:
```
# 1

im=cv.imread('butterfly.jpg',cv.IMREAD_REDUCED_GRAYSCALE_4)
assert im is not None

box_kernal=1./81*np.ones((9,9))
im_avg=cv.filter2D(im,-1,box_kernal)

k_size=9
sigma=4
im_gau=cv.GaussianBlur(im,(k_size,k_size),sigma)

fig,ax=plt.subplots(1,3,figsize=(18,6))

ax[0].imshow(im,cmap='gray',vmin=0,vmax=255)
ax[0].set_title('Original')

ax[1].imshow(im_avg,cmap='gray',vmin=0,vmax=255)
ax[1].set_title('Avg')

ax[2].imshow(im_gau,cmap='gray',vmin=0,vmax=255)
ax[2].set_title('Gau')
```

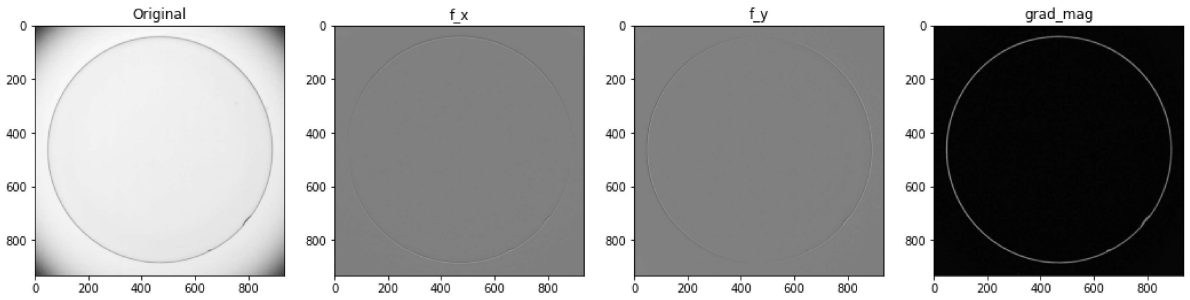
Out[ ]:
```
Text(0.5, 1.0, 'Gau')
```



In [ ]:
```
# 2

f=cv.imread('contact_lens.tif',cv.IMREAD_GRAYSCALE).astype(np.float32)
assert f is not None


sobel_v=np.array([[-1,-2,-1],[0,0,0],[1,2,1]],
dtype=np.float32)

f_x=cv.filter2D(f,-1,sobel_v)

sobel_h=np.array([[-1,0,1],[-2,0,2],[-1,0,1]],
dtype=np.float32)
```

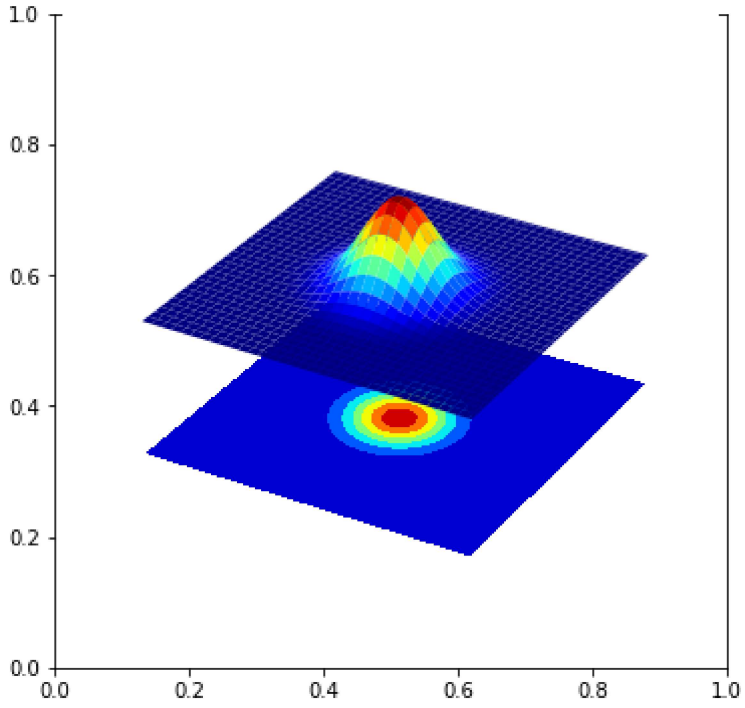
```
f_y=cv.filter2D(f,-1,sobel_h)

grad_mag=np.sqrt(f_x**2+f_y**2)

fig,ax=plt.subplots(1,4,figsize=(18,6))

ax[0].imshow(f,cmap='gray',vmin=0,vmax=255)
ax[0].set_title('Original')

ax[1].imshow(f_x,cmap='gray',vmin=-1020,vmax=1020)
ax[1].set_title('f_x')

ax[2].imshow(f_y,cmap='gray',vmin=-1020,vmax=1020)
ax[2].set_title('f_y')

ax[3].imshow(grad_mag,cmap='gray')
ax[3].set_title('grad_mag')
```

Out[ ]:
```
Text(0.5, 1.0, 'grad_mag')
```



In [ ]:
```
# 3
from mpl_toolkits.mplot3d import axes3d
from matplotlib import cm

fig,ax=plt.subplots(1,1,figsize=(6,6))
ax=fig.add_subplot(111,projection='3d')
step=0.1
x=np.arange(-5,5+step,step)
y=np.arange(-5,5+step,step)

xx,yy=np.meshgrid(x,y)

sigma=1.
g=np.exp(-(xx**2+yy**2)/(2*sigma**2))
surf=ax.plot_surface(xx,yy,g,cmap=cm.jet)

cset=ax.contourf(xx,yy,g,zdir='z',offset=np.min(g)-1.5,cmap=cm.jet)

ax.set_zlim(np.min(g)-2,np.max(g))

plt.axis('off')
```

Out[ ]:
```
(-5.499999999999998, 5.499999999999963, -5.499999999999998, 5.499999999999963)
```



In [ ]:
```
# 4

f=cv.imread('tom.jpg',cv.IMREAD_GRAYSCALE).astype(np.float32)
assert f is not None

sigma=2
gaussian_1d=cv.getGaussianKernel(5,sigma)
f_lp=cv.filter2D(f,-1,gaussian_1d,gaussian_1d)
f_hp=f-f_lp
f_sharp=cv.addWeighted(f,1.0,f_hp,8.0,0)


fig,ax=plt.subplots(1,4,figsize=(18,6))

ax[0].imshow(f,cmap='gray',vmin=0,vmax=255)
ax[0].set_title('Original')

ax[1].imshow(f_lp,cmap='gray',vmin=0,vmax=255)
ax[1].set_title('f_lp')

ax[2].imshow(f_hp,cmap='gray')
ax[2].set_title('f_hp')

ax[3].imshow(f_sharp,cmap='gray',vmin=0,vmax=255)
ax[3].set_title('f_sharp')
```

Out[ ]:
```
Text(0.5, 1.0, 'f_sharp')
```