EN2550 Excercise 04

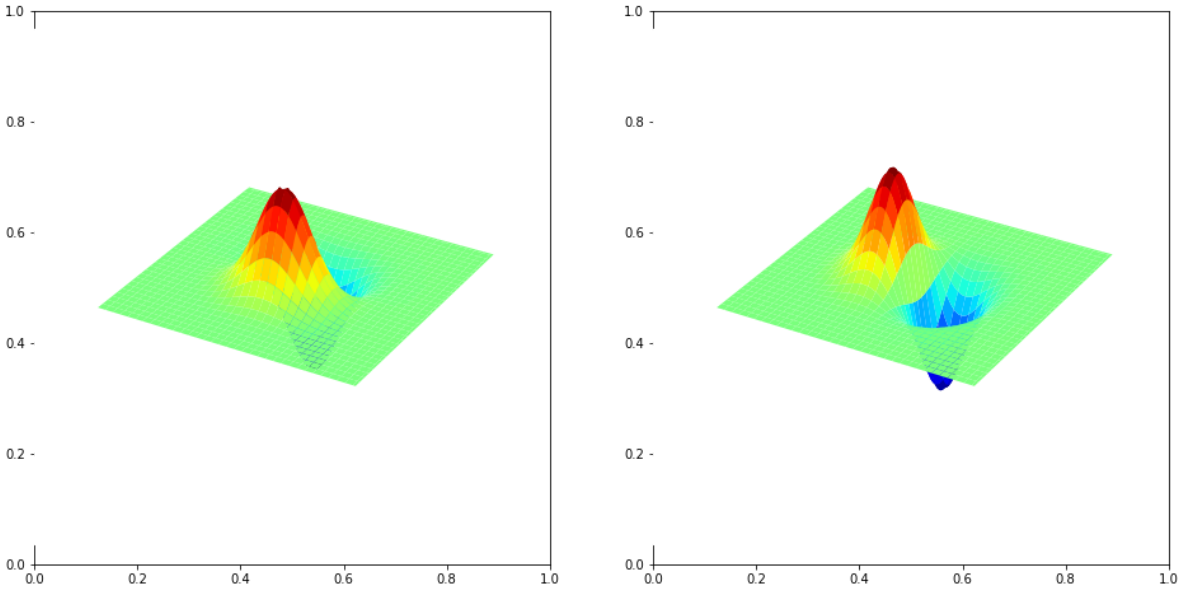
Index No. : 190018V

Name : Abeywickrama K.C.S.

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

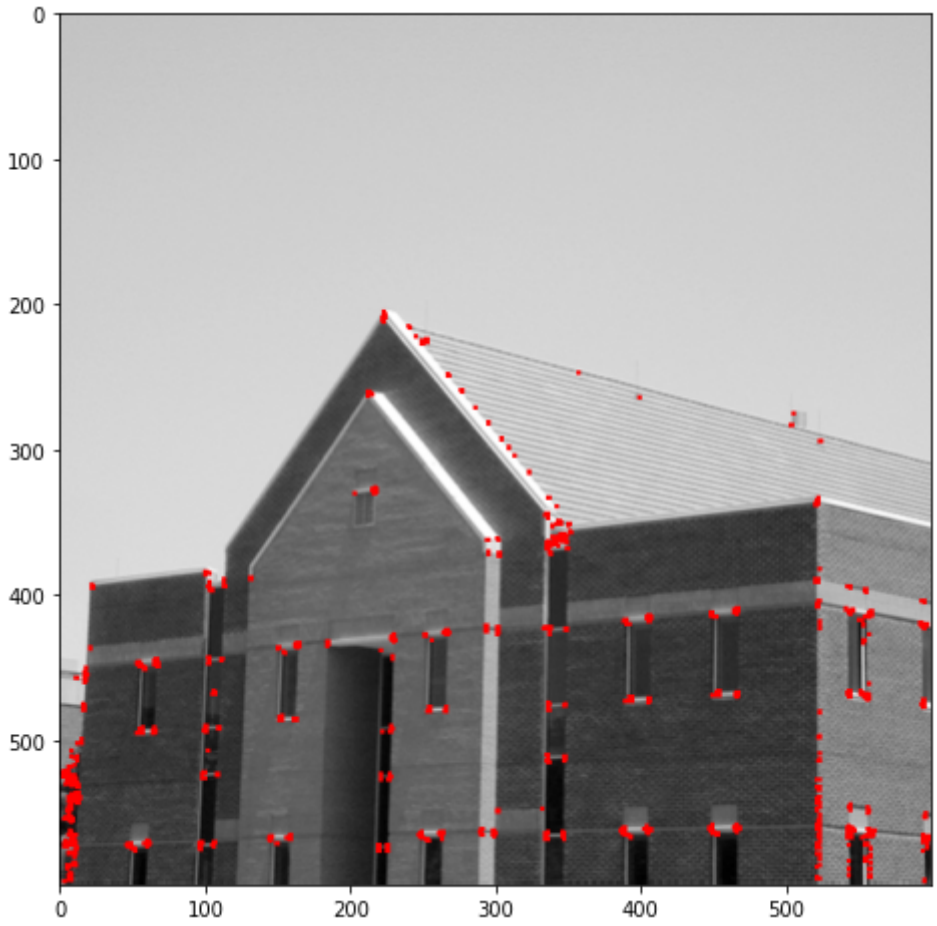
In [ ]:
```
# imports
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt
```

In [ ]:
```
# 1
from mpl_toolkits.mplot3d import Axes3D
from matplotlib import cm

fig , ax = plt.subplots(1,2,figsize=(16,8))
ax1 = fig.add_subplot(121,projection ='3d')
ax2 = fig.add_subplot(122,projection ='3d')

delta = 0.1
XX , YY = np.meshgrid(np.arange(-5 , 5 + delta, delta),np.arange(-5 , 5+delta,delta

sigma = 1
g = np.exp(-(XX**2 + YY**2)/(2*sigma**2))
g /= np.sum(g)

sobel_v = np.array([[-1,-2,-1],[0,0,0],[1,2,1]],dtype=np.float32)
g_x = cv.filter2D(g, -1 , sobel_v)

sobel_h = np.transpose(sobel_v).astype(np.float32)
g_y = cv.filter2D(g, -1 , sobel_h)

surf1 = ax1.plot_surface(XX,YY,g_x,cmap=cm.jet, linewidth=0,antialiased =True)
surf2 = ax2.plot_surface(XX,YY,g_y,cmap=cm.jet, linewidth=0,antialiased =True)

ax1.axis('off')
ax2.axis('off')

plt.show()
```



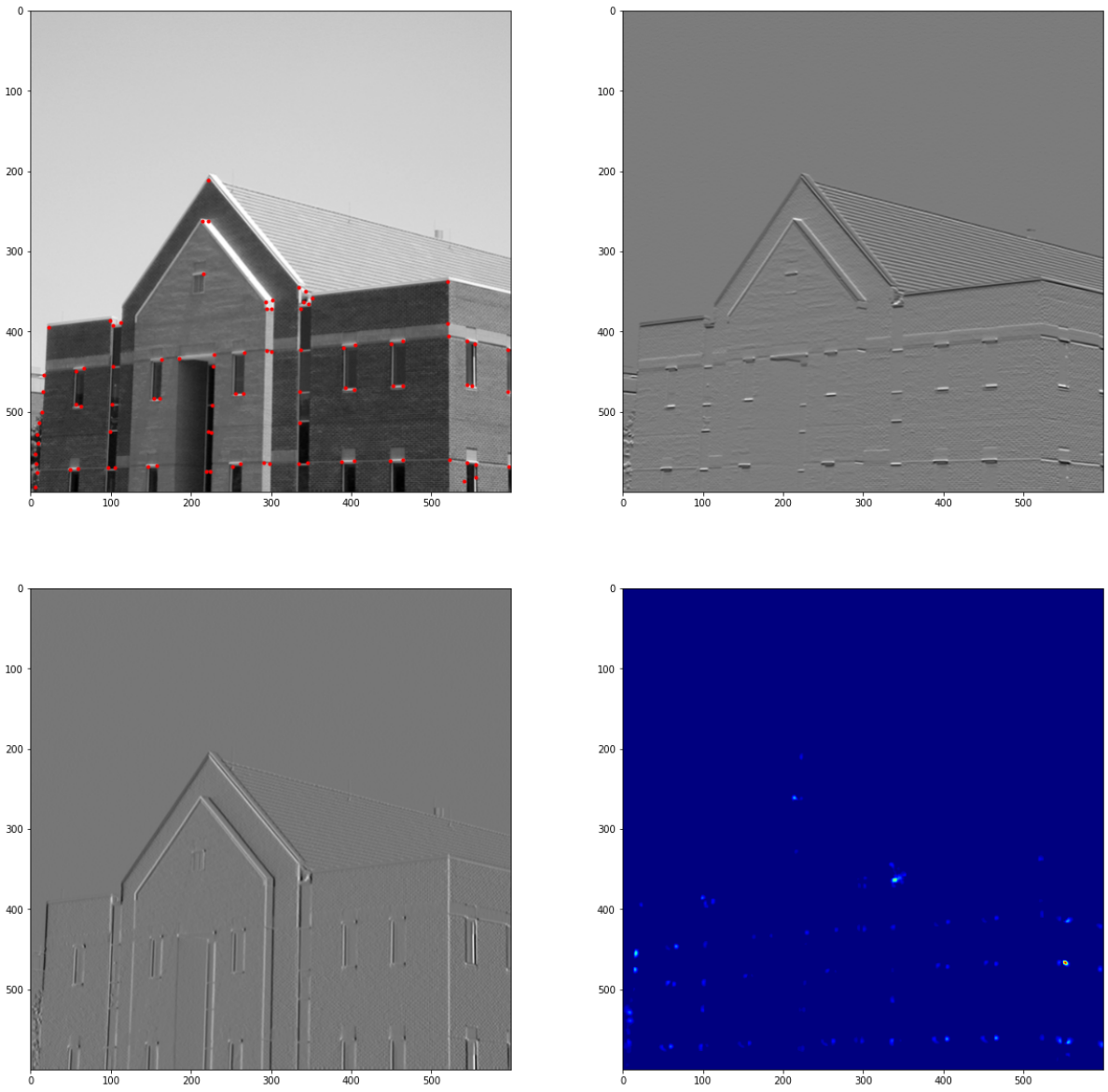
In [ ]:
```
# 2
im=cv.imread('building.tif',cv.IMREAD_COLOR)
assert im is not None

gray=cv.cvtColor(im,cv.COLOR_BGR2GRAY)
gray=np.float32(gray)
dst=cv.cornerHarris(gray,2,3,0.04)

dst=cv.dilate(dst,None)
im[dst>0.01*dst.max()]=[255,0,0]

fig,ax=plt.subplots(1,1,figsize=(8,8))
ax.imshow(im)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x229a8948430>
```



In [ ]:
```
# 3
from skimage.feature import  peak_local_max
from matplotlib import cm

im=cv.imread('building.tif',cv.IMREAD_COLOR)
assert im is not None

I=cv.cvtColor(im,cv.COLOR_BGR2GRAY)
I=np.float32(I)
sobel_v = np.array([[-1,-2,-1],[0,0,0],[1,2,1]],dtype=np.float32)
sobel_h = np.transpose(sobel_v).astype(np.float32)

Ix=cv.filter2D(I,-1,sobel_v)
Iy=cv.filter2D(I,-1,sobel_h)

sigma=3
ksize=7
```

```
m11=cv.GaussianBlur(Ix*Ix,(ksize,ksize),sigma)
m12=cv.GaussianBlur(Ix*Iy,(ksize,ksize),sigma)
m21=m12
m22=cv.GaussianBlur(Iy*Iy,(ksize,ksize),sigma)

det=m11*m22-m12*m21
trace=m11+m22
alpha=0.04
R=det-alpha*trace**2

R[R<1e8]=0
coordinates=peak_local_max(R,min_distance=2)

fig,ax=plt.subplots(2,2,figsize=(20,20))
ax[0,0].imshow(im,cmap='gray')
ax[0,0].plot(coordinates[:,1],coordinates[:,0],'r.')
ax[0,1].imshow(Ix+127,cmap='gray')
ax[1,0].imshow(Iy+127,cmap='gray')
ax[1,1].imshow(R+127,cmap=cm.jet)

plt.show()
```



In [ ]:

```
# 4
im=cv.imread('building.tif',cv.IMREAD_GRAYSCALE)
assert im is not None

edges=cv.Canny(im,100,200)
```

```
fig,ax=plt.subplots(1,2,figsize=(20,20))

ax[0].imshow(im,cmap='gray')
ax[1].imshow(edges,cmap='gray')
```

```
<matplotlib.image.AxesImage at 0x247b7931420>
```