

Index No : 190328V

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In [ ]: %matplotlib inline
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In [ ]: import matplotlib.pyplot as plt
import numpy as np
import cv2 as cv
```

Q01

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

fig , ax = plt.subplots(1,2, figsize =(16,8),facecolor = 'white')
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)

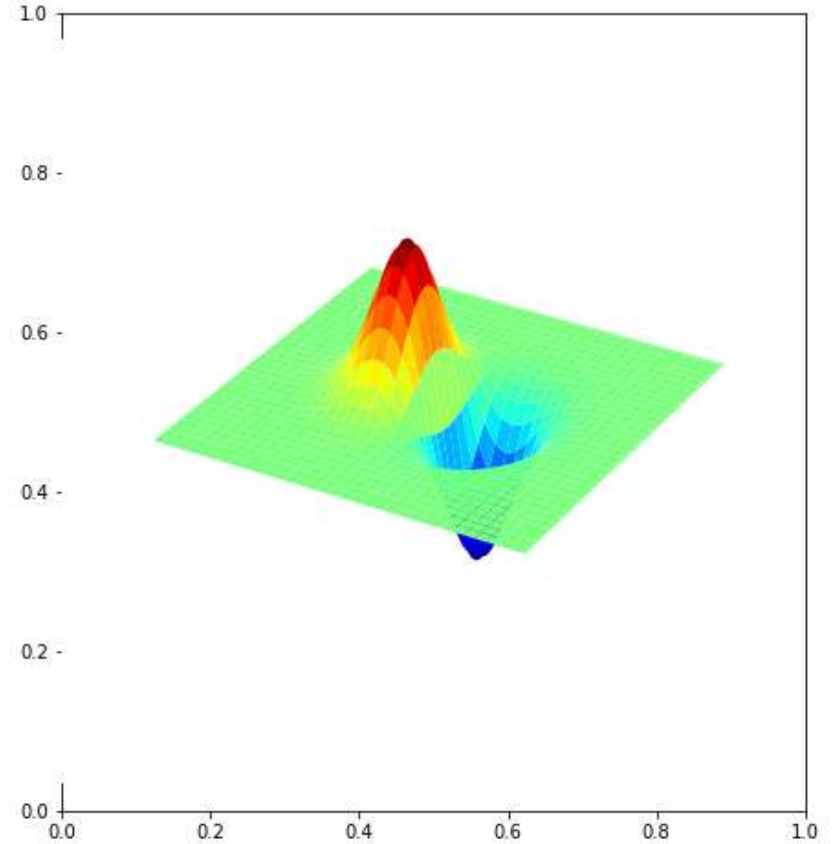
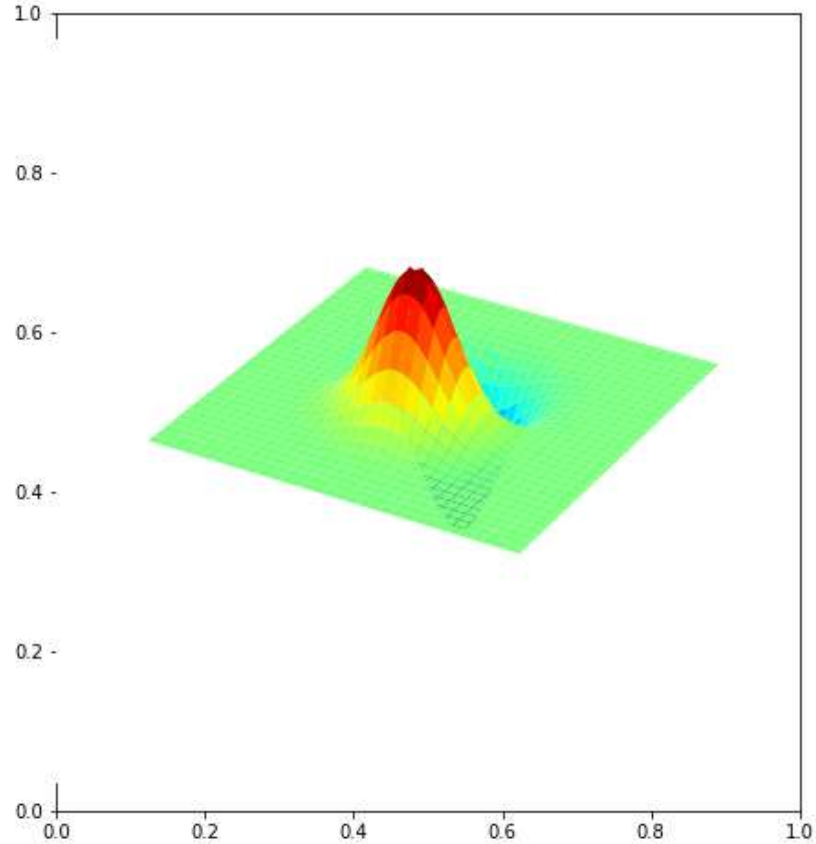
sobel_v = np.array([[[-1,-2,-1],[0,0,0],[1,2,1]],dtype =np.float32)
g_x = cv.filter2D(g,-1,sobel_v)
sobel_h = np.array([[[-1,0,1],[-2,0,2],[-1,0,1]],dtype =np.float32)
g_y = cv.filter2D(g,-1,sobel_h)

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')
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ax2.axis('off')
```

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plt.show()
```



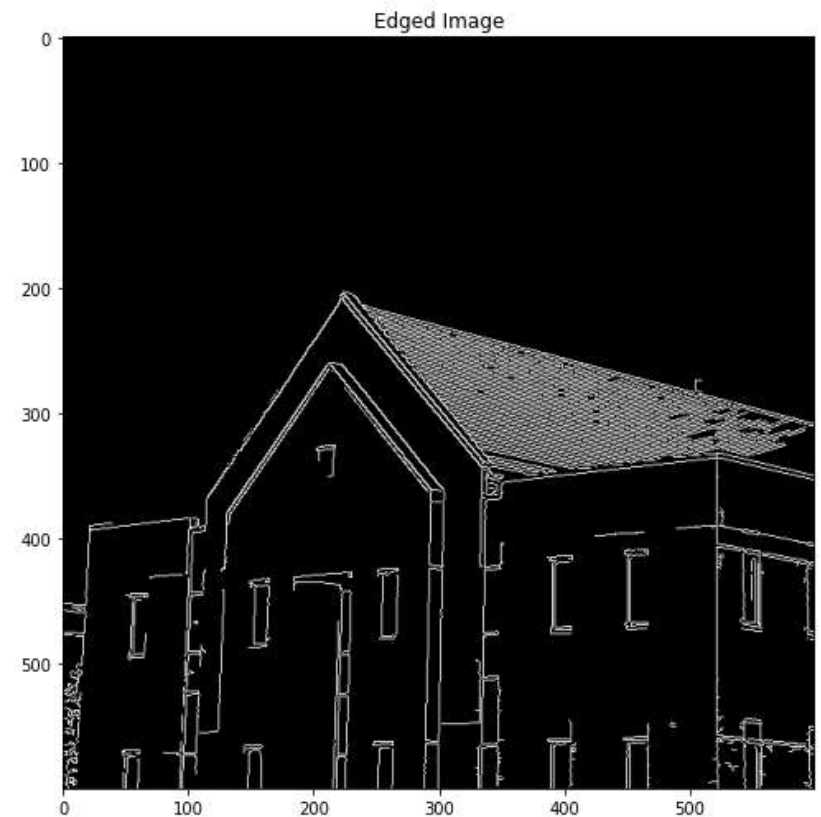
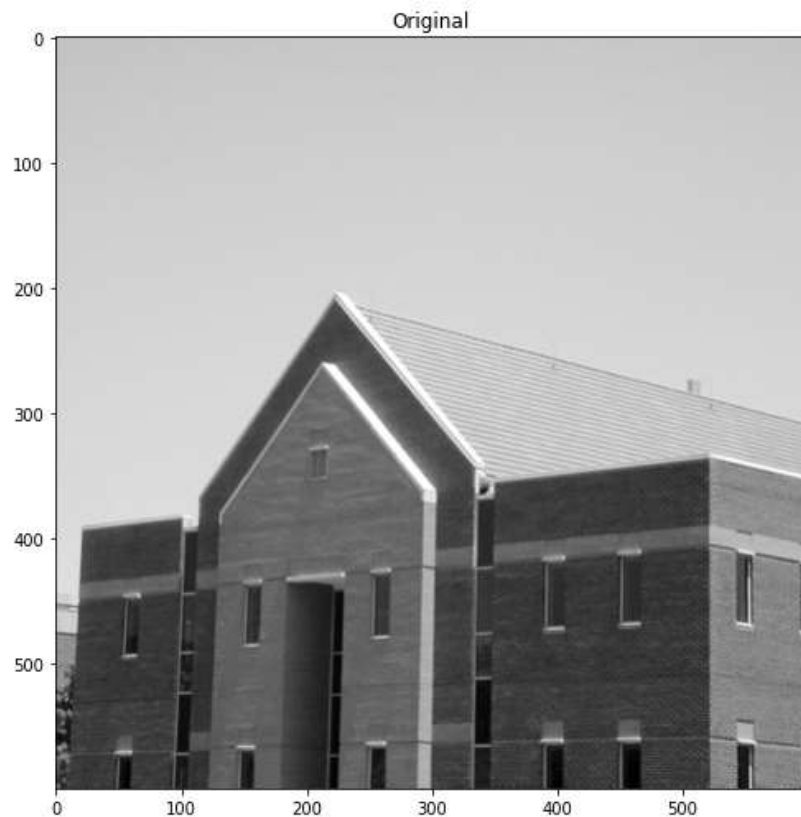
Q02

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In [ ]: im = cv.imread(r'./Images/building.tif',cv.IMREAD_GRAYSCALE)
        assert im is not None

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

        fig , ax = plt.subplots(1,2,figsize=(18,9),facecolor = 'white')
        ax[0].imshow(im,cmap = 'gray',vmin = 0, vmax =255)
        ax[0].set_title('Original')
        ax[1].imshow(edges,cmap = 'gray',vmin = 0, vmax =255)
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ax[1].set_title('Edged Image')  
plt.show()
```



Q03

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In [ ]: im = cv.imread(r'./Images/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()]=[0,0,255]  
        cv.imshow('dst',im)  
        cv.waitKey(0)  
        cv.destroyAllWindows()
```

Q04S

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In [ ]: from skimage.feature import peak_local_max

im = cv.imread(r'./Images/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.array([[[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]], dtype = np.float32)

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

sigma = 3
ksize = 7

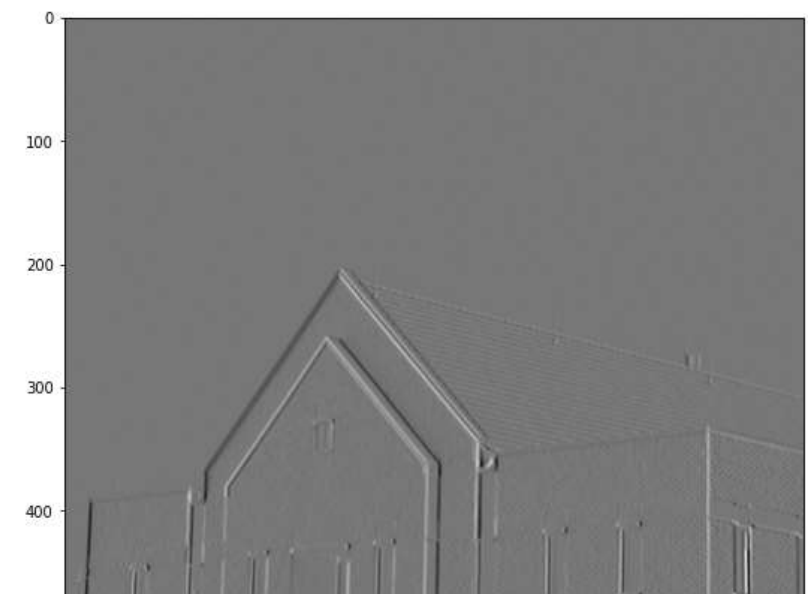
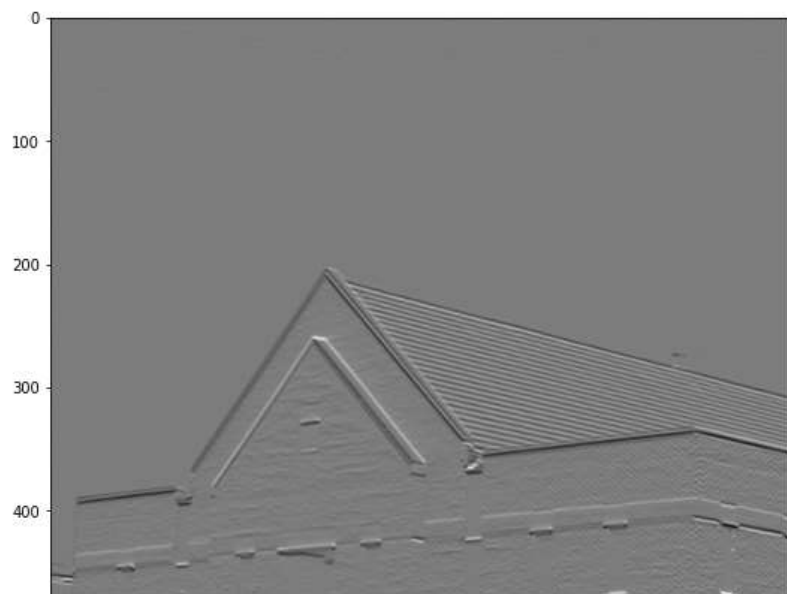
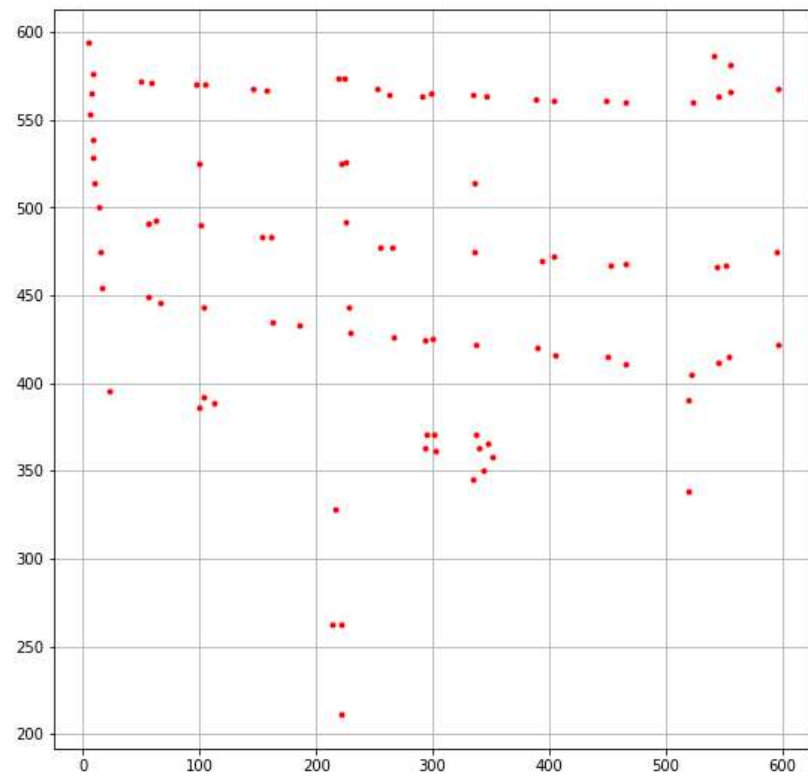
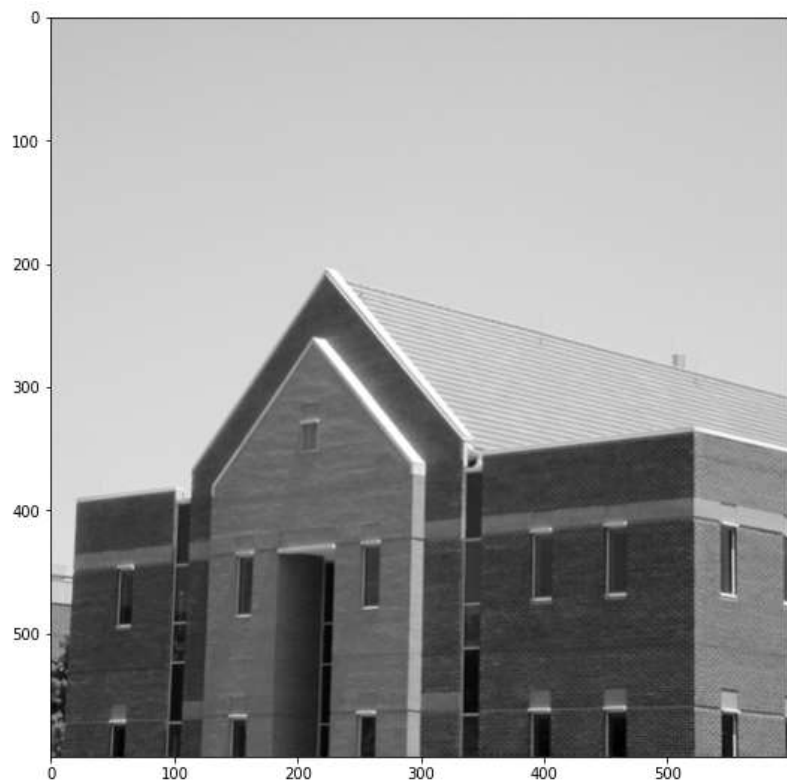
m11 = cv.GaussianBlur(Ix*Ix, (ksize, ksize), sigma)
m12 = cv.GaussianBlur(Ix*Iy, (ksize, ksize), sigma)
m21 = m12
m22 = cv.GaussianBlur(Iy*Iy, (ksize, ksize), sigma)

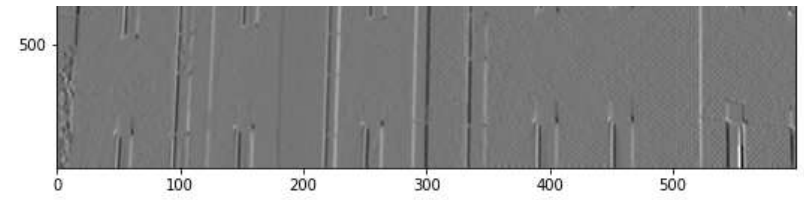
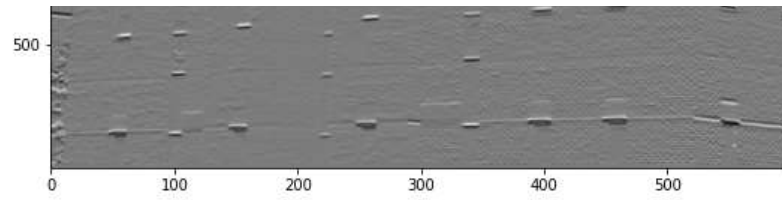
det = m11*m22-m12*m21
trace = m11+m22
alpha = 0.04

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), facecolor='white')
ax[0, 0].imshow(im, cmap='gray')
ax[0, 1].plot(coordinates[:, 1], coordinates[:, 0], 'r.')
ax[0, 1].grid('on')
ax[1, 0].imshow(Ix+127, cmap='gray')
ax[1, 1].imshow(Iy+127, cmap='gray')

plt.show()
```





In []: