EN2550 Excercise 07

Index No. : 190018V

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

In [ ]:
```python
# q1

import numpy as np
from plyfile import PlyData, PlyElement # open3d is the standard
import matplotlib.pyplot as plt
pcd = PlyData.read('airplane.ply')
assert pcd is not None
points = np.concatenate((pcd['vertex']['x'].reshape(1, -1), pcd['vertex']['y'].resh
points = points - np.mean(points, axis=1).reshape(3,1)

ones = np.ones((1, points.shape[1]))
X = np.concatenate((points, ones), axis=0)

R = np.array([[1, 0, 0],[0, 1, 0], [0, 0, 1]])
K = np. array ([[1, 0, 0],[0, 1, 0], [0, 0, 1]])
t = np.array([[0], [0], [-4000]])

P1 = K @ np.concatenate((R, t), axis=1)

tilt = 30*np.pi/180

R=np.array([[np.cos(tilt),-np.sin(tilt),0],[np.sin(tilt),np.cos(tilt),0],[0,0,1]])
K=np.array([[0.8,0,0],[0,0.8,0],[0,0,1]])
t=np.array([[0],[0],[-4000]])


P2 = K @ np.concatenate((R, t), axis=1)
x1 = P1 @ X
x2 = P2 @ X
xl = x1/x1[2,:]
x2 = x2/x2[2,:]
fig, ax = plt.subplots(1, 1, sharex=True, sharey=True)
ax.scatter(xl[0,:], xl[1,:])
ax.scatter(x2[0,:], x2[1,:])
ax.axis('equal')
plt.show()
```
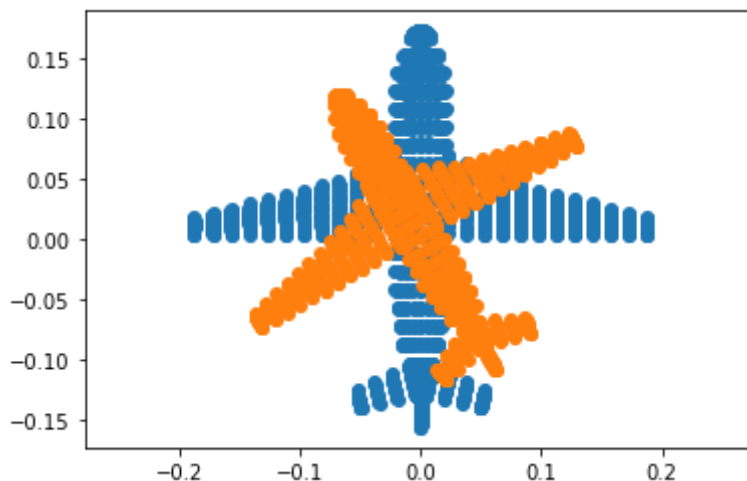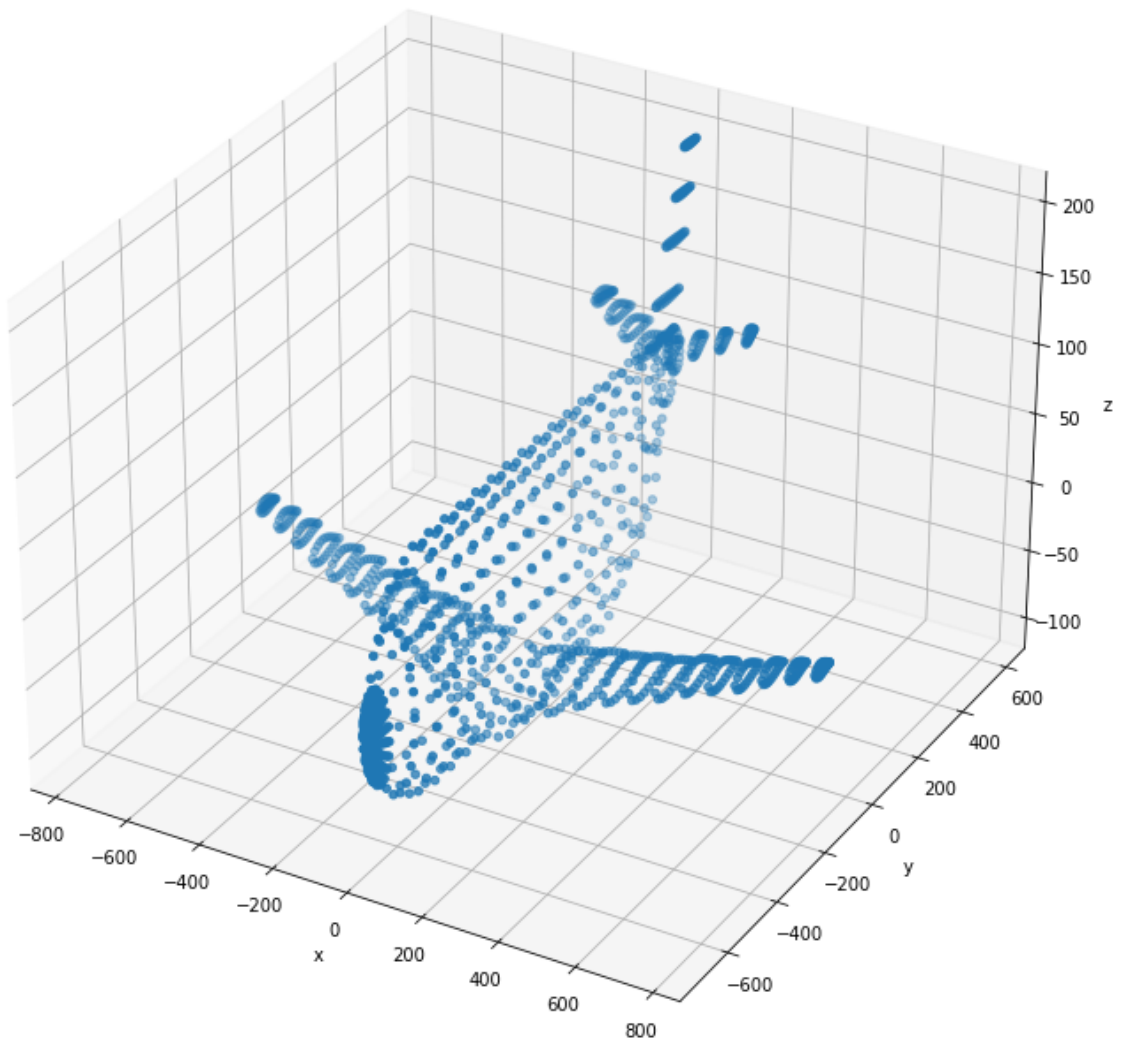
```
In [ ]: fig = plt.figure(figsize=(12,12))
        ax = fig.add_subplot(111, projection='3d')
        ax.scatter(points[0, : ], points[1,:], points[2,:])
        ax.set_xlabel( 'x')
        ax.set_ylabel('y')
        ax.set_zlabel('z')
```

Out[ ]: Text(0.5, 0, 'z')


```
In [ ]: # q3
        import cv2 as cv
        import numpy as np

        im = cv.imread(r'earrings.jpg', cv. IMREAD_COLOR)
        assert im is not None
        hsv = cv.cvtColor(im, cv.COLOR_BGR2HSV)
        th, bw = cv.threshold(hsv[:,:, 1], 0, 255, cv.THRESH_BINARY + cv.THRESH_OTSU)
        # Remove dots in the object foregound using closing
        w = 5
        kernel = np.ones((w,w), np.uint8)
        opened = cv.morphologyEx(bw, cv.MORPH_CLOSE, kernel)

        retval, labels, stats, centroids = cv.connectedComponentsWithStats(bw)
        colormapped = cv.applyColorMap((labels/np.amax(labels)*255).astype('uint8'),cv.COL(

        Z = 720 # mm
        f = 8 # mm
```

```python
for i, s in enumerate(stats):
    if i != 0:
        print('Item ', i, ', area in pixels =', s[4])
        print('ltem ', i, ', area in mmA2 =', s[4]*(2.2e-3)**2*(Z*Z)/(f*f))


fig,ax=plt.subplots(2,3,figsize=(20,12))
ax[0,0].imshow(cv.cvtColor(im,cv.COLOR_BGR2RGB))
ax[0,0].set_title("Orginal")

ax[0,1].imshow(cv.cvtColor(hsv[:, :, 1],cv.COLOR_BGR2RGB))
ax[0,1].set_title("HSV")

ax[1,0].imshow(cv.cvtColor(bw,cv.COLOR_BGR2RGB))
ax[1,0].set_title("BW")

ax[1,1].imshow(cv.cvtColor(opened,cv.COLOR_BGR2RGB))
ax[1,1].set_title("Opened")

ax[1,2].imshow(cv.cvtColor(colormapped,cv.COLOR_BGR2RGB))
ax[1,2].set_title("Colormapped")

[axi.set_axis_off() for axi in ax.ravel()]

plt.show()
```

```
Item  1 , area in pixels = 59143
ltem  1 , area in mmA2 = 2318.642172
Item  2 , area in pixels = 59211
ltem  2 , area in mmA2 = 2321.3080440000003
```


In [ ]: