

**Assignment No:1**

**Name:Ravi Singi**

**RollNo: 2018900095**

1. Implement the DLT (Direct Linear Transformation) based calibration that we discussed in the class:

Ans:

Am using the below python script to view the image and find the image points physically.

```
import matplotlib.pyplot as plt
import cv2
import numpy as np

im = cv2.imread("IMG_5455.JPG")

im_resized = cv2.resize(im, (5472, 3648),
interpolation=cv2.INTER_LINEAR)
plt.imshow(cv2.cvtColor(im_resized, cv2.COLOR_BGR2RGB))
plt.show()
```

Now by using the measurements.jpg file am able to get the world points as shown below

```
worldpoints = [[0, 36, 0], [0, 0, 36], [36, 0, 0], [0, 72, 0], [36,
36, 0],
               [36, 72, 0], [0, 0, 72], [36, 0, 36]]
```

Now am trying to create a Directlineartransformation method to use DLT approach and find the camera coordinates. Please find the code below

```
import numpy as np

def directlineartransformation(worldpoints, picpoints):
    xyz = np.asarray(worldpoints)
    uv = np.asarray(picpoints)
```

```

count_points = np.shape(xyz)[0]
A = []
for i in range(count_points):
    x = xyz[i, 0]
    y = xyz[i, 1]
    z = xyz[i, 2]
    u = uv[i, 0]
    v = uv[i, 1]
    A.append([x, y, z, 1, 0, 0, 0, 0, -u*x, -u*y, -u*z, -u])
    A.append([0, 0, 0, 0, x, y, z, 1, -v*x, -v*y, -v*z, -v])

A = np.asarray(A)
U, S, V = np.linalg.svd(A)
H = V[11, :]
H = H.reshape(3, 4)
H = H/H[2, 3]
return H

def main():
    worldpoints = [[0, 36, 0], [0, 0, 36], [36, 0, 0], [0, 72, 0],
[36, 36, 0],
                    [36, 72, 0], [0, 0, 72], [36, 0, 36]]
    picturepoints = [[4859.28, 1376.08], [4716.33, 2432.86], [3838.23,
2371.66], [
                    4900.12, 543.923], [4032.23, 1319.92], [4057.76, 508.16],
[4649, 2780], [3700.39, 2698.33]]
    outputmatrix = directlineartransformation(worldpoints,
picturepoints)
    print(outputmatrix)

main()

```

The output is as shown below:

[[-4.08200380e+01 8.35534496e+00 -1.24033708e+01 4.79754533e+03]

[-4.49065010e+00 -2.17921666e+01 1.89176180e+00 2.19251586e+03]

[-3.87994746e-03 1.41248177e-03 -2.21739626e-03 1.00000000e+00]]