Assignment - 3:

Q1.

(b) Methodology:

We have found key points in each image and obtained the homography matrix by selecting any 4 random key points in each image.
Then the inliers are found by applying RANSAC with a certain threshold distance. The best homography matrix is chosen as the one which has maximum number of inliers.

If the number of inliers exceeds a certain threshold value then the homography matrix is considered as the best one and RANSAC is halted.

Obtained Output:

The value of the homography matrix sample obtained between a pair of images is as shown .

```
homography between 2 and 1
[[ 7.76711113e-01 -3.83525930e-02  1.04260057e+02]
 [-3.71260944e-02  9.14153260e-01  1.40058670e+01]
 [-5.39597870e-04 -2.20513977e-05  1.00000000e+00]]
homography between 3 and 2
[[ 7.76934934e-01 -5.65588933e-02  9.36451244e+01]
 [-4.32856029e-02  8.91816228e-01  2.04759890e+01]
 [-5.19536647e-04 -1.04586617e-04  1.00000000e+00]]
homography between 4 and 3
[[ 1.40508087e+00  3.34958542e-02 -1.78709740e+02]
 [ 1.13643837e-01  1.29117680e+00 -4.57348154e+01]
 [ 9.45215230e-04  2.34658632e-04  1.00000000e+00]]
```

Q1(c) and (d)

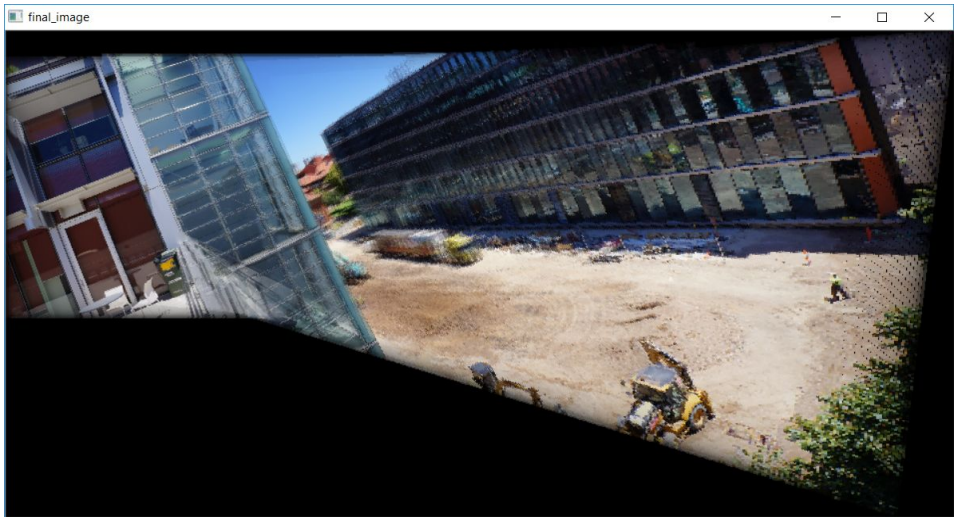
Methodology:

We first compute the homography matrix for the pair of images (1,2),(2,3),(3,4). The homography matrix from 4 to 1 and 3 to 1 are obtained from the computed homography matrices. After bringing all points to the coordinates of the first image, we display them as shown. We have used Linear blending to smoothen the output of the image.

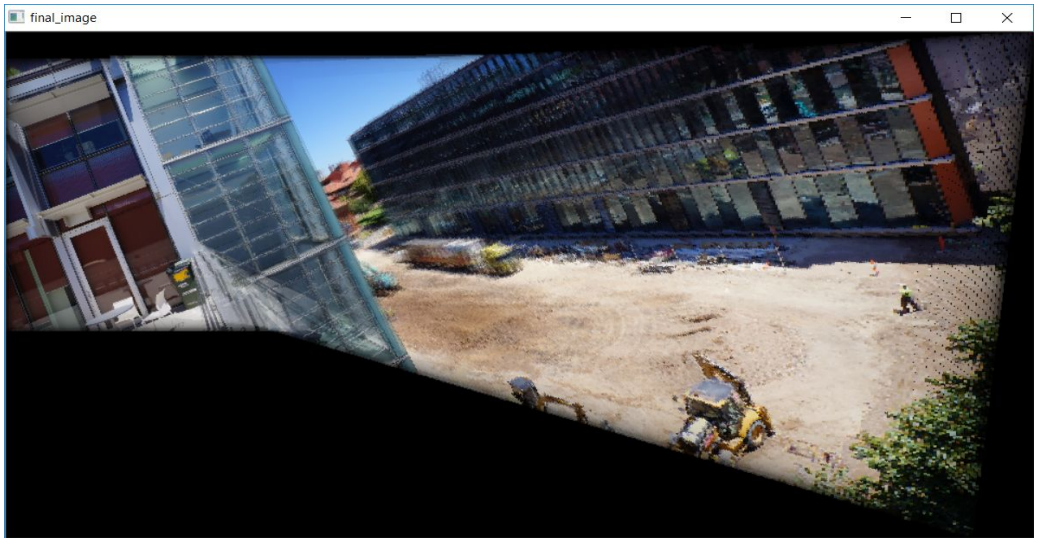
In part (d) the inbuilt function is used to estimate homography

Obtained Panorama:

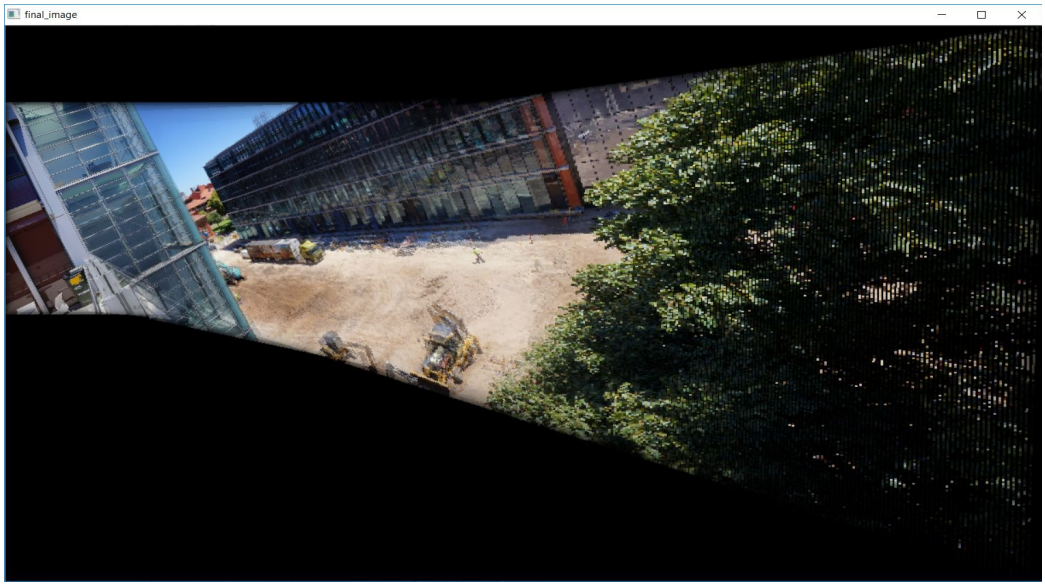
(i) Using my homography matrix



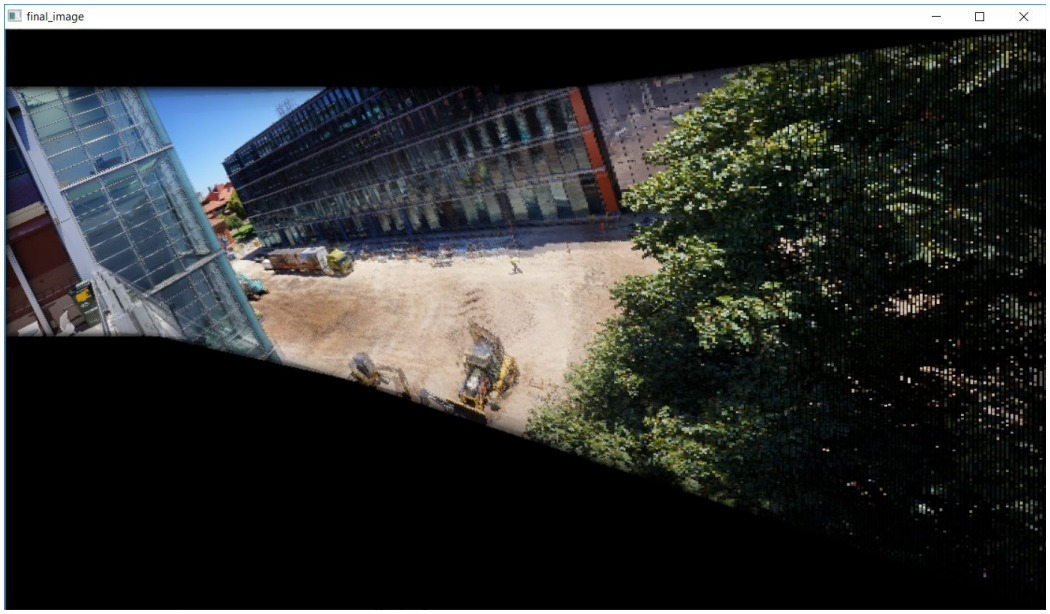
Using inbuilt homography matrix



(ii) Using my homography matrix:



Using inbuilt homography matrix:



Observations:

It is observed that the output homography and inbuilt homography almost give the same result. This indicated the correctness of the computed homography.

Q2. (d)

Methodology :

We have considered each keypoint in the original image and have classified it according to its depth value and obtain the homography matrix for all values in that depth level.

Obtained Homography Matrix:

```
level 1
[[ 1.24196640e+00 -2.28446382e-02 -9.38020108e+01]
 [ 6.25011713e-02  1.11924537e+00 -2.79145388e+01]
 [ 3.86639021e-04 -2.00368430e-04  1.00000000e+00]]

level 2
[[ 1.34441233e+00  1.07985251e-01 -1.22077236e+02]
 [ 7.04283180e-02  1.22303693e+00 -3.28914814e+01]
 [ 4.58966771e-04  2.90660430e-04  1.00000000e+00]]

level 3
[[ 1.23033618e+00 -2.33684790e-02 -8.62784940e+01]
 [ 6.61152143e-02  1.11143030e+00 -2.83447022e+01]
 [ 3.85325775e-04 -9.33550468e-05  1.00000000e+00]]

level 4
[[ 1.48573109e+00  5.70768844e-01 -2.36157407e+02]
 [ 7.21312408e-02  1.50151271e+00 -6.99288813e+01]
 [ 4.32383969e-04  8.73986068e-04  1.00000000e+00]]

level 5
[[ 1.39487624e+00  4.26848655e-01 -2.07485247e+02]
 [ 5.24371836e-02  1.38248241e+00 -6.13942593e+01]
 [ 3.79780097e-04  5.27994067e-04  1.00000000e+00]]
```

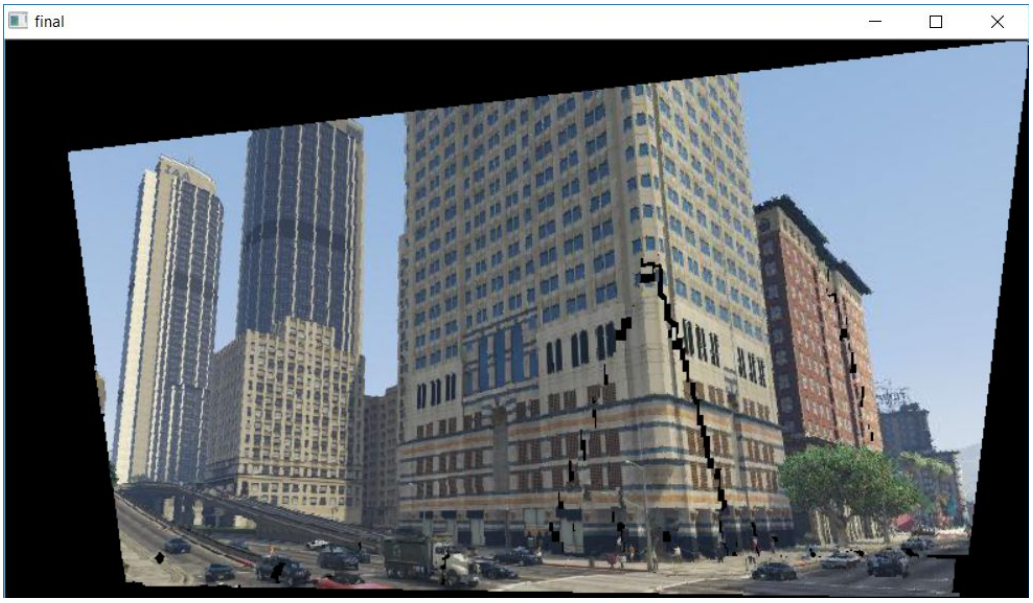
Q2(e)

Methodology:

The obtained values of the Homography matrix are used to warp all the images at different values of depth levels. The obtained output is merged to get the final image.

Outputs obtained:

Image 1:



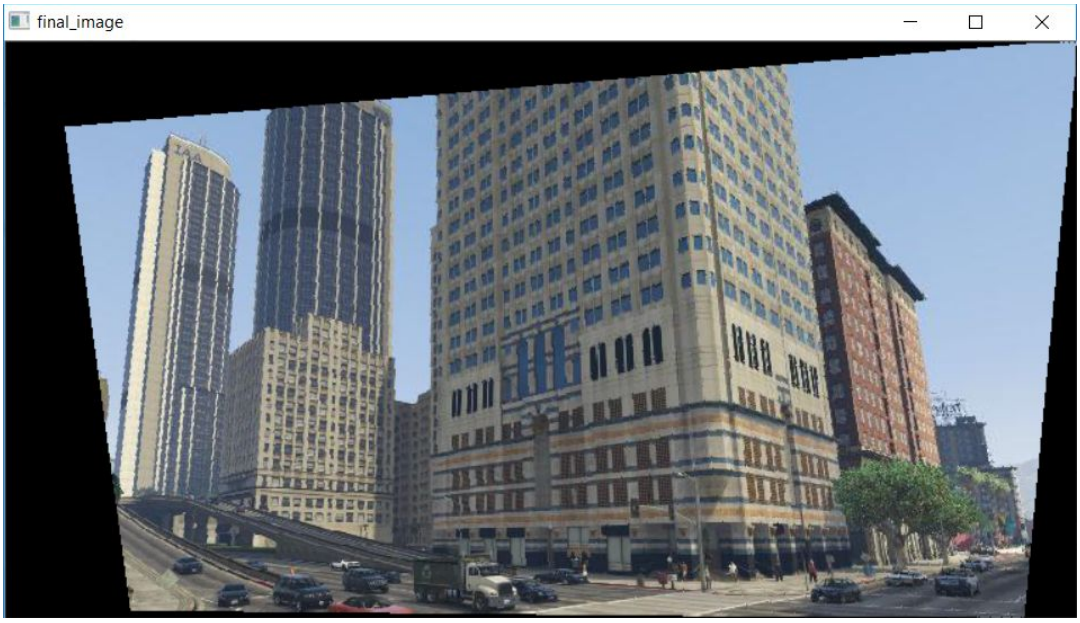
(f)

Methodology:

Here we have warped the entire image using a single homography matrix.

Output Obtained:

Image 1:



Observations:

The output obtained is similar to the output obtained by using homography matrix at each depth level. The black lines in the output obtained by using multiple homography matrices is due to lack of proper key points in each depth level.