HomeWork 3 Balaji Suresh(bs 681)

To run the first part of the code just run the function cailb\_3D .

To run the second part of the code just run the function calib\_2D

For the third part run the function augumented\_reality\_image

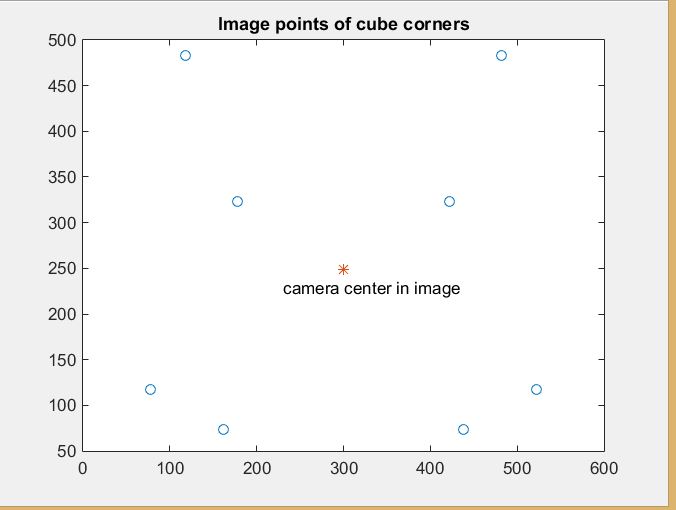
For the 2nd part of the 3rd question run cube\_adding

None of these functions take any arguments and can be run directly

1.

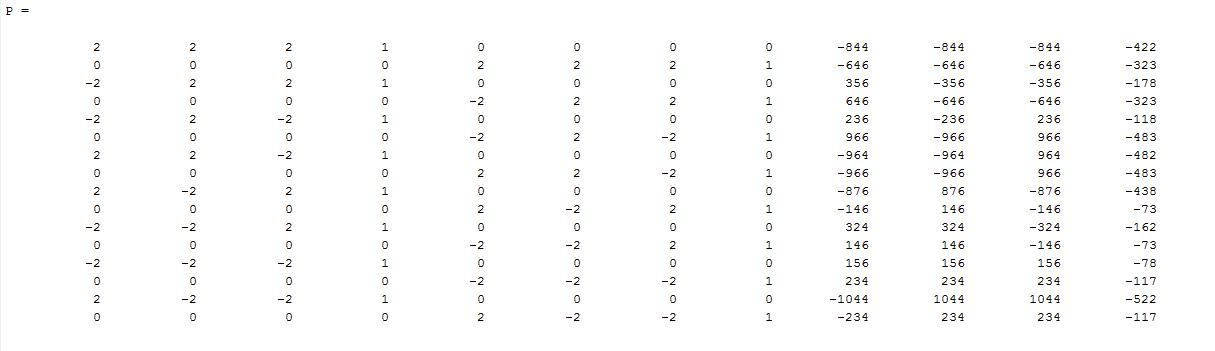
Part 1

The image points results is as below



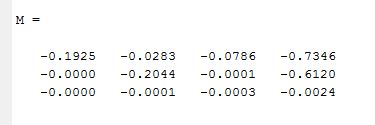
Part 2&3

The matrix P obtained is



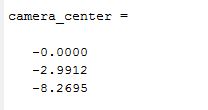
Part 4

The matrix M obtained is



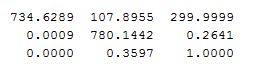
Part 5

The camera center obtained is

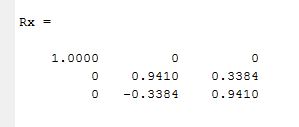


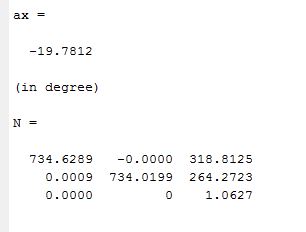
Part 6

The matrix M’ is

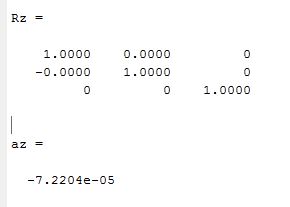


Part 7

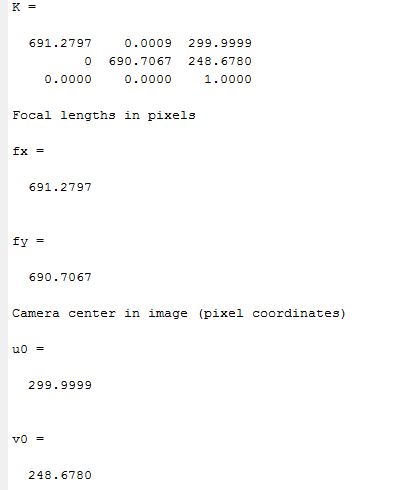




Part 8

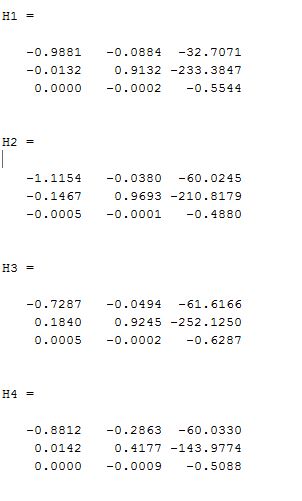


Part 9

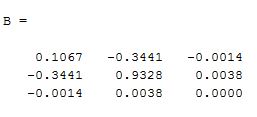


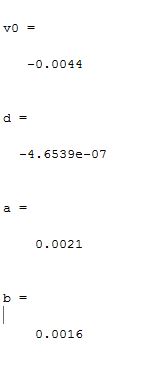
2

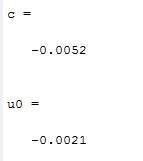
The Homography values for different images are

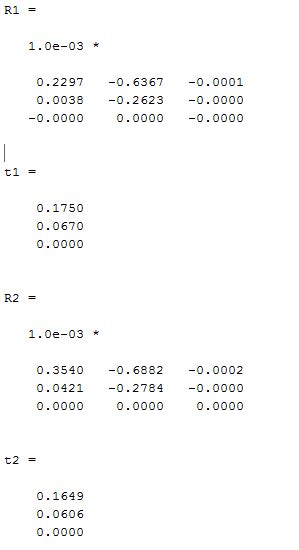


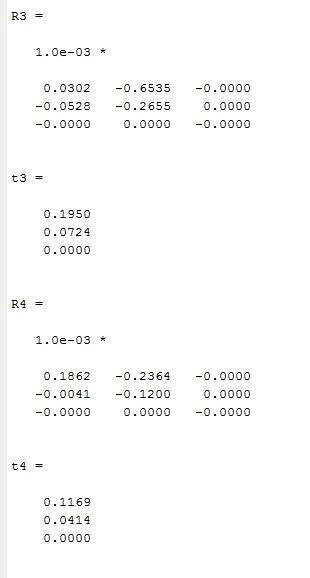
The value of B is











R2\_enforced =

0.6995 -0.7146 -0.0008

-0.7146 -0.6995 -0.0004

0.0003 -0.0008 1.0000

R’ x R =

1.0000 0.0000 -0.0000

0.0000 1.0000 0.0000

-0.0000 0.0000 1.0000

R3\_enforced =

0.3862 -0.9224 0.0003

-0.9224 -0.3862 0.0001

0.0000 -0.0003 -1.0000

R’ x R =

1.0000 -0.0000 0.0000

-0.0000 1.0000 -0.0000

0.0000 -0.0000 1.0000

R4\_enforced =

0.7864 -0.6177 0.0002

-0.6177 -0.7864 0.0001

0.0001 -0.0002 -1.0000

R’ x R =

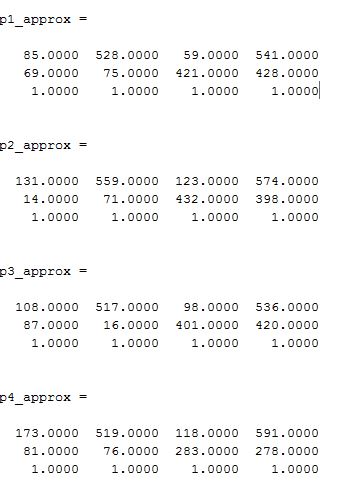
1.0000 -0.0000 0.0000

-0.0000 1.0000 -0.0000

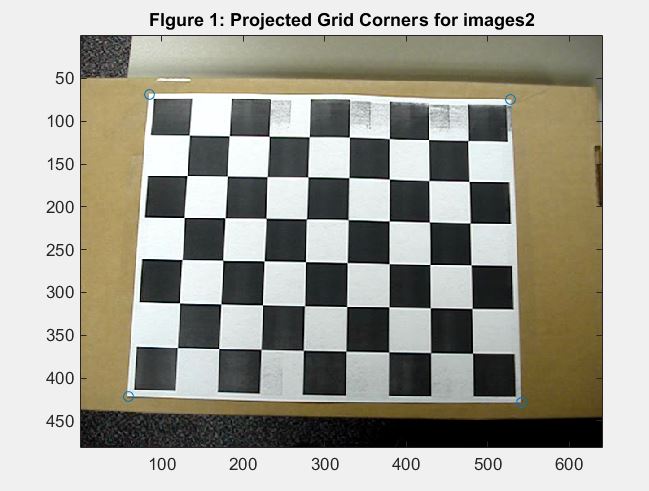
0.0000 -0.0000 1.0000

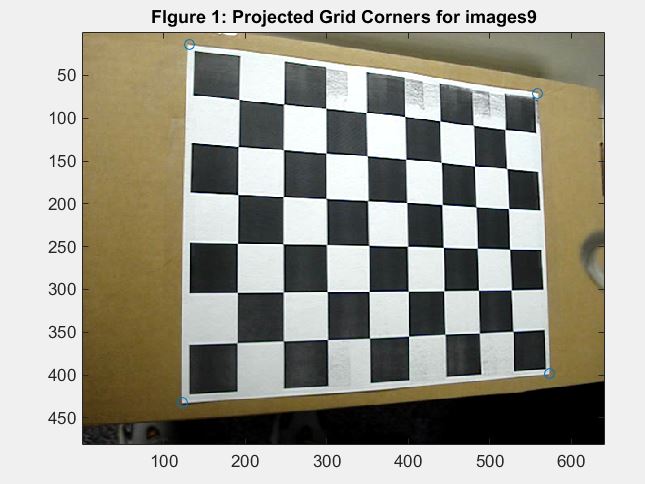
Improving accuracy

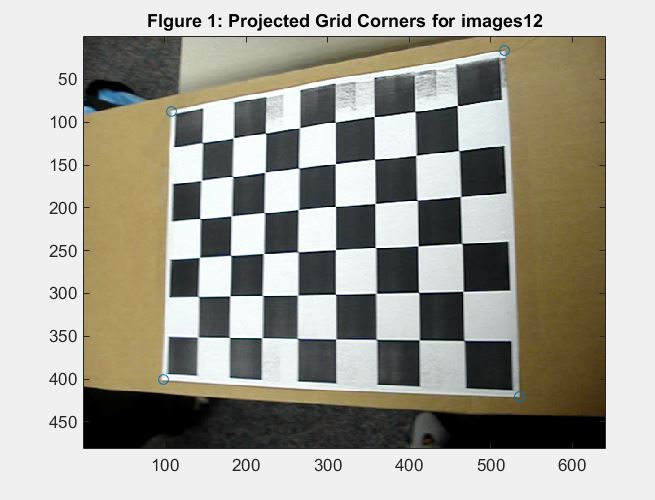
The p\_approx all the four images and its points in the actual image

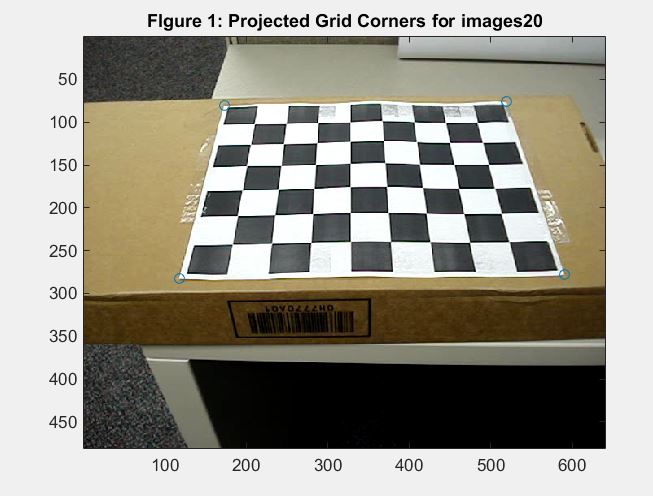


The figures of the image grid with the approximate grid locations are as below

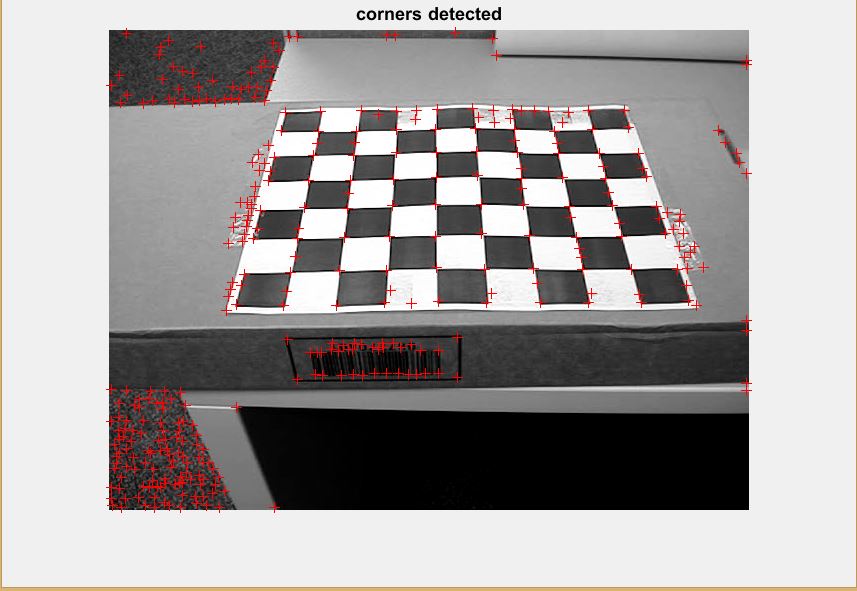


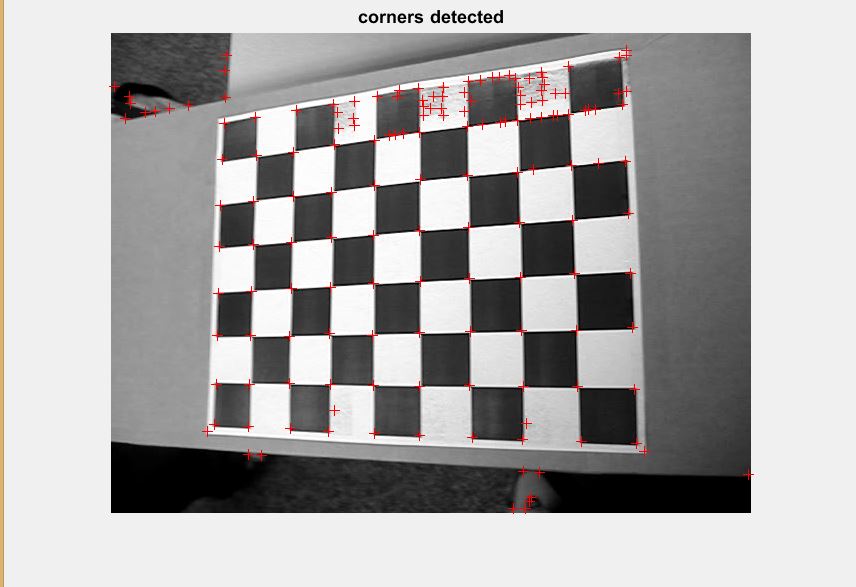


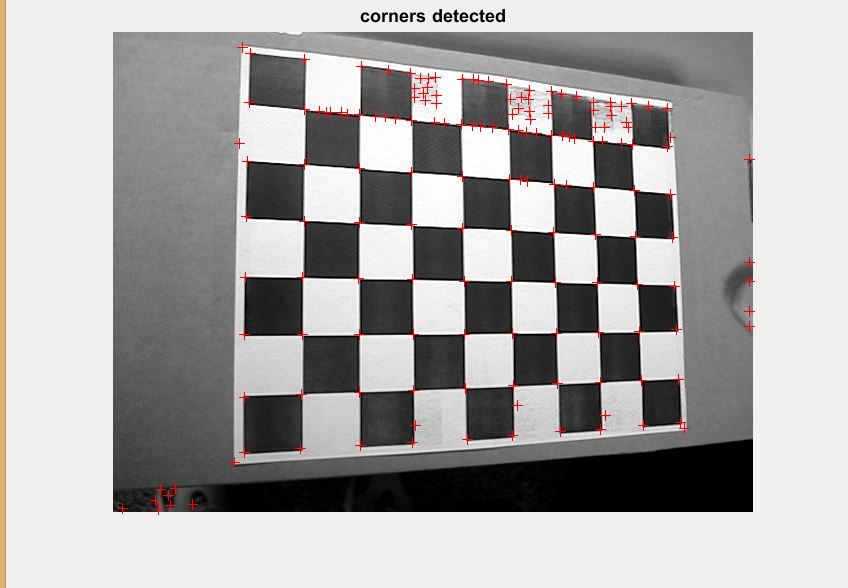


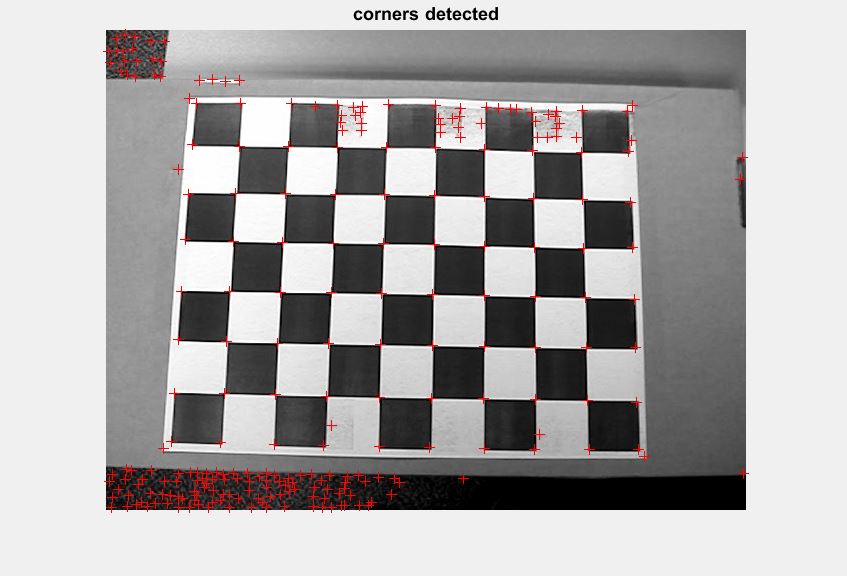


The Image results for Harris corner are as below

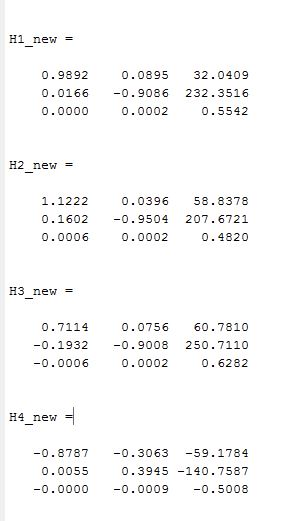




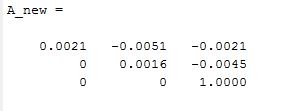


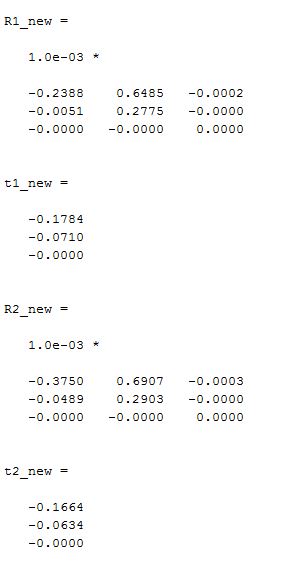


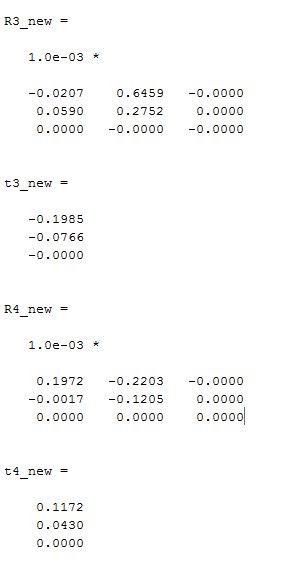
The new homographies are as given below



The value of A,R,T and the rotation matrix for each image is given below







R1\_new\_enforced =

-0.6259 0.7799 0.0006

0.7799 0.6259 0.0002

0.0002 -0.0006 1.0000

R2\_new\_enforced =

-0.7197 0.6942 0.0008

0.6942 0.7197 0.0004

0.0003 -0.0008 1.0000

R3\_new\_enforced =

-0.3870 0.9221 0.0003

0.9221 0.3870 0.0001

-0.0000 0.0003 -1.0000

R4\_new\_enforced =

0.8197 -0.5728 -0.0002

-0.5728 -0.8197 -0.0001

0.0001 -0.0002 1.0000

err\_reprojection1 =

0.3838

2.5167

4.3776

4.7330

err\_reprojection2 =

3.9326

54.0893

2.1980

5.0303

err\_reprojection3 =

48.2156

4.7287

5.2207

6.5119

err\_reprojection4 =

23.7276

32.7428

3.6733

10.7711

3.

The last 4 digits of my RUID is 6042 . Thus I used the 2nd image for this part

Image 1



Image 2



Image 3



Image 4



Part 2



Extra Credit

2.

Since we have 5 intrinsic parameters we end up having four equations .Thus we have infinite number of solutions. Hence lets make an assumption that gamma(y)=0.This makes us get 4 intrinsic parameters by adding the constraint [0,1,0,0,0,0]b = 0 to the equation Vb=0.With the assumptions we can solve all the intrinsic parameters and hence the matrix A can be computed . Once we get A we can compute the other extrinsic parameters. Thus we can solve the intrinsic and extrinsic parameters