CSci 5561: Homework 4
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2.1
Codes:
Q2_wrapper.m : It has code to extract features and calls the respective function
It also has script to draw epipolar lines.
[F_new] = compute_findFundamentalMatrix(P1,P2)

2.2
[F_RS] = compute_fundamental_Robust(P1,P2,thresh)

The figure below shows the SIFT image features which were used to compute fundamental matrix. Corresponding points were labelled with same numbers in both images. The same .fig file is also attached with the report.

The plots below show some images with their corresponding epipolar lines. The plots on the left side show the point in the left image with red circle and the plot in the right has corresponding epipolar line.

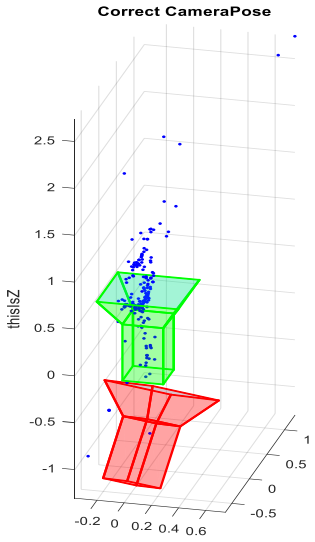
Rank Constraint:
After computing fundamental matrix from eight point method, I did singular value decomposition of F and set the last singular value to zero and recomputed F = U*S*V.

3.1
Codes:
Q3_wrapper: It loads the camera intrinsics for the images. Please choose the respective for the corresponding images chosen. It also has code for cecking
function [R,t] = compute_RT_fromEssential(E)

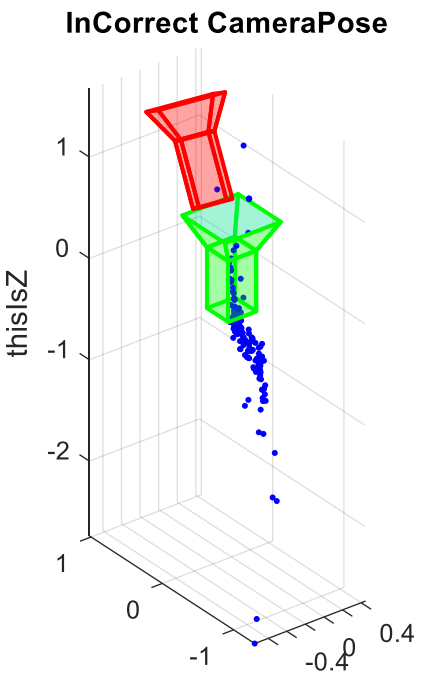
3.2
[P] = selectCorrectProjectionMatrix(PM2,P1_tri,P2_tri)

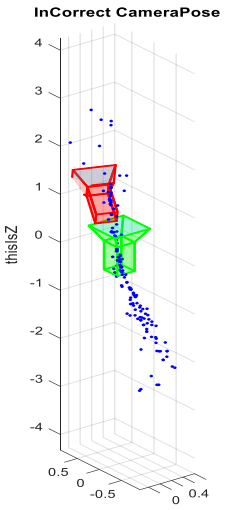
The plots below show the four-extracted camera poses for 00000015.JPG and 00000017.JPG stereo pair. The green camera represents left camera present at origin and red camera shows right camera pose. As we can the triangulated points are in front of the camera in this pose as obtained by cheriality condition.

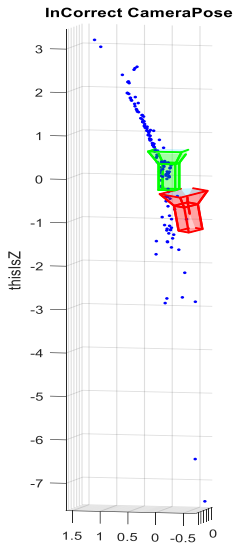
This is correct camera pose.



These are incorrect camera poses.


InCorrect CameraPose
thisIsZ
1
0
-1
-2
1
0
-1
0.4
0
-0.4


InCorrect CameraPose
thisIsZ
4
3
2
1
0
-1
-2
-3
-4
0.5
0
-0.5
0
0.4



Rank Constraint on Essential Matrix:

Yes, the rank constraint applies to essential matrix as well because essential matrix is $K'^{T}FK$ where F is the fundamental matrix and K are the intrinsics of the camera.
F has rank 2 constraint. Also E = SR, where S is the skew of T, which is the translation vector. It is evident the skew matrix is a rank 2. Since E is a linear combination of S. Therefore, E also has rank 2 constraint.

4. Stereo Rectification

Codes included:
Script - MyStereoRectify.m which calls MyRectify.m which does ART decomposition and finds the transformation. The script also does image wrapping using the foud transformation

Left image

Right image

Rectified left image

Rectified right image

The rectified correct camera pose: