Problem Set 1
CS4495 - Fall2014
Cristina Chu (cchu43)

Part 1: Calibration

1.1 Least Square Function

M_Normalized_Points =

0.4583	0.0040	-0.5411	0.1783
-0.2947	-0.0509	-0.0524	-0.0443
-0.0140	-0.0546	0.1090	0.5968

Last_Point_Projection =

0.9183
-0.9171

Last_Point_Projection_Residual = 0.9058

1.2 Average residuals

k = 8

average_Residuals =

1.0e+08 *

0.2168
0.0186
0.0124
0.0100
1.3490
0.5911
0.0008
0.0156
0.0343
1.5102

bestM =

0.0071	-0.8230	-0.0074	0.0000
-0.0042	0.0015	-0.5679	-0.0000
-0.0010	0.0011	0.0000	-0.0035

k = 12

average_Residuals =

1.0e+07 *

0.8546
0.2106
0.3903
0.3241
0.1638
0.2520
0.1197
1.6189
0.3870
0.2769

bestM =

-0.0070	0.8258	0.0073	-0.0000
0.0041	-0.0016	0.5638	0.0000
0.0013	-0.0010	-0.0000	0.0034

k = 16

average_Residuals =

1.0e+08 *

0.0222
0.0148
1.3036
0.0232
0.0143
0.0263
0.0204
0.0256
0.0218
0.0264

bestM =

-0.0070	0.8267	0.0073	-0.0000
0.0040	-0.0016	0.5625	0.0000
0.0013	-0.0010	-0.0000	0.0034

Overall Best M

k=16

bestM =

-0.0070	0.8267	0.0073	-0.0000
0.0040	-0.0016	0.5625	0.0000
0.0013	-0.0010	-0.0000	0.0034

By looking at the average residuals, it seems as if greater value of k means lower averages. This might happen because a smaller k means that the calibration matrix is receiving information from less points, making it easier for “coincidental” information to change the calibration matrix (i.e. overfitting).

Also in the average residuals, it can be seen that some values are a lot higher than the other ones for the same k value; this is probably due to outlier points used in the calculations. These outliers are also a reason why it is better to use more points.

1.3 Camera Center (best_M is for k=16)

My camera center is actually wrong because my m matrix is not correct. I think that at the time of reshaping the matrix I am doing something wrong, but I am not completely sure what.

cameraCenter =

-2.6130
-0.0222
0.0187

Part 2: Fundamental Matrix Estimation

2.1 Least Squares Function (Full Rank)

F =

-0.0000	0.0000	-0.0019
0.0000	0.0000	0.0172
-0.0009	-0.0264	0.9995

2.2 Least Squares Function (Rank Reduction)

F =

-0.0000	0.0000	-0.0019
0.0000	0.0000	0.0172
-0.0009	-0.0264	0.9995

2.3 Epipolar Lines

Image A

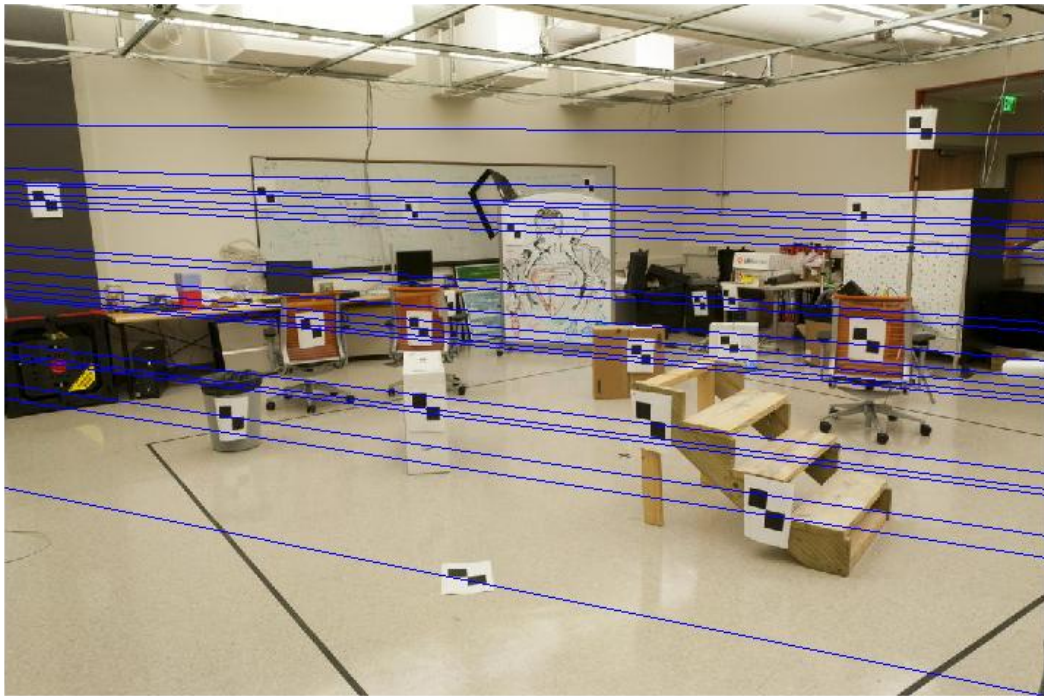

Image B