Report on cs280 HW2:

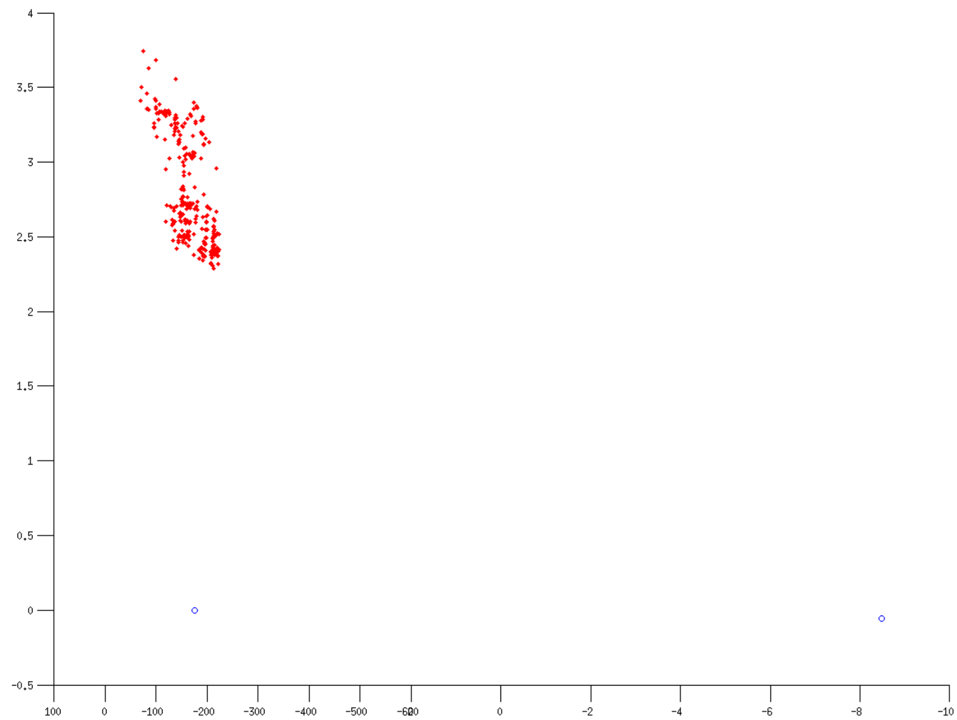
Jason Liang
Nan Tian

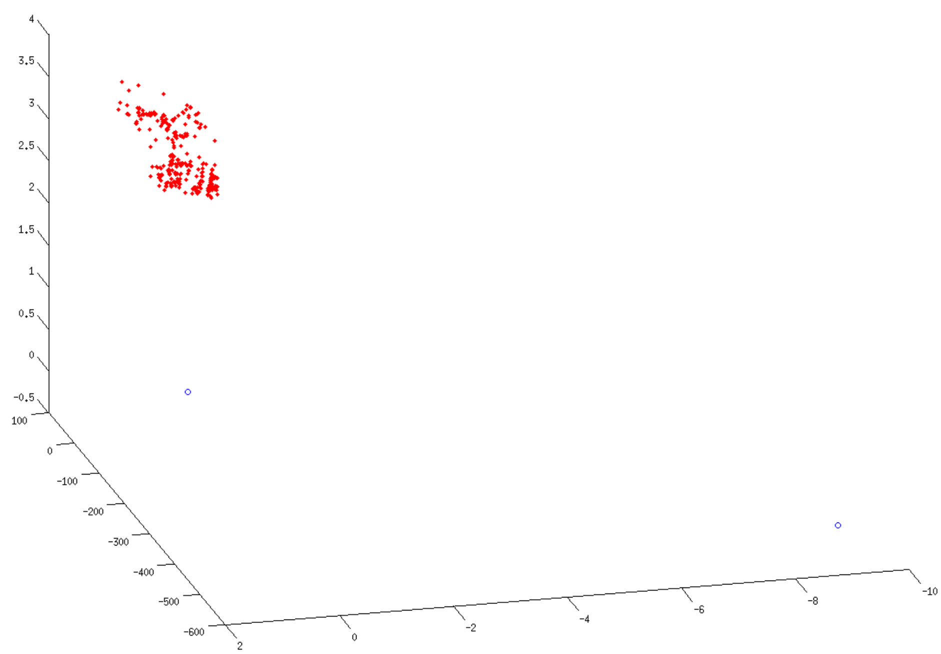
For this project, we implemented all the algorithms according to the way it was specified in the pdf paper. We used SVD decomposition to solve for the fundamental matrix and also used it in order to derive the rotation matrices and translation vectors from the essential matrix. Some of the challenges that we faced including correctly calculating the residual error and also making sure that we returned the correct rotation matrixes (their determinant had to be 1).

Answer to question in fundamental_matrix.m:
No, we are directly trying to optimize distance*sqrt(a^2+b^2) with the SVD when solving the homogeneous system. We are trying to optimize for the equation Ax=0, which is the constraint that the two matching points on the two images must lie on the epipolar plane. It is related to the residual distance*sqrt(a^2+b^2), but not the direct distance from the point and epipolar line. By minimizing distance*sqrt(a^2+b^2), we made the system linear which can be solved by SVD easily.

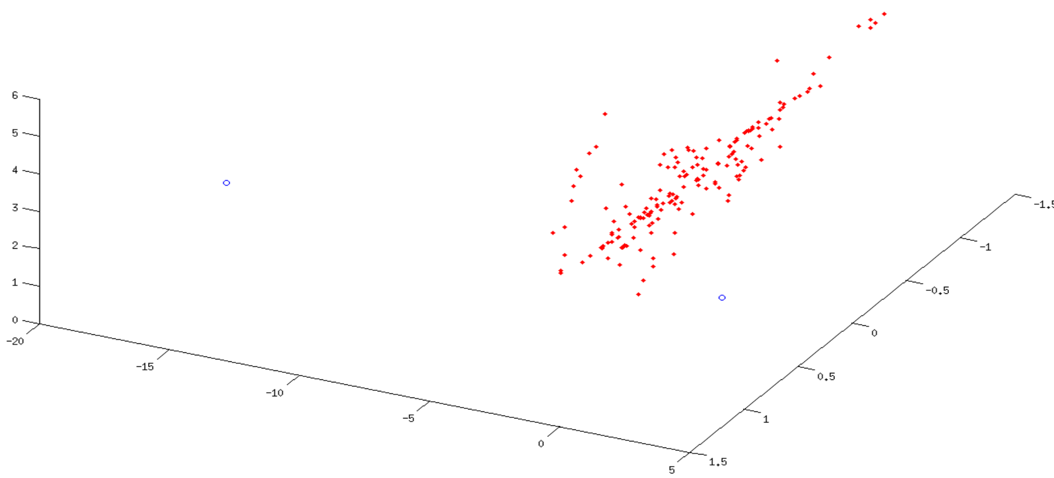
Answer to question in find_3d_points.m:
Yes, according to the equations x_1 = P_1*X and x_2 = P_2*X, we are basically trying to find a value of X such that its projection onto the image planes minimizes the error the projection and the given 2d x_1, x_2 errors. Thus our reconstruction error is being optimized by this system of linear equations.

Plots of Library Point Cloud:

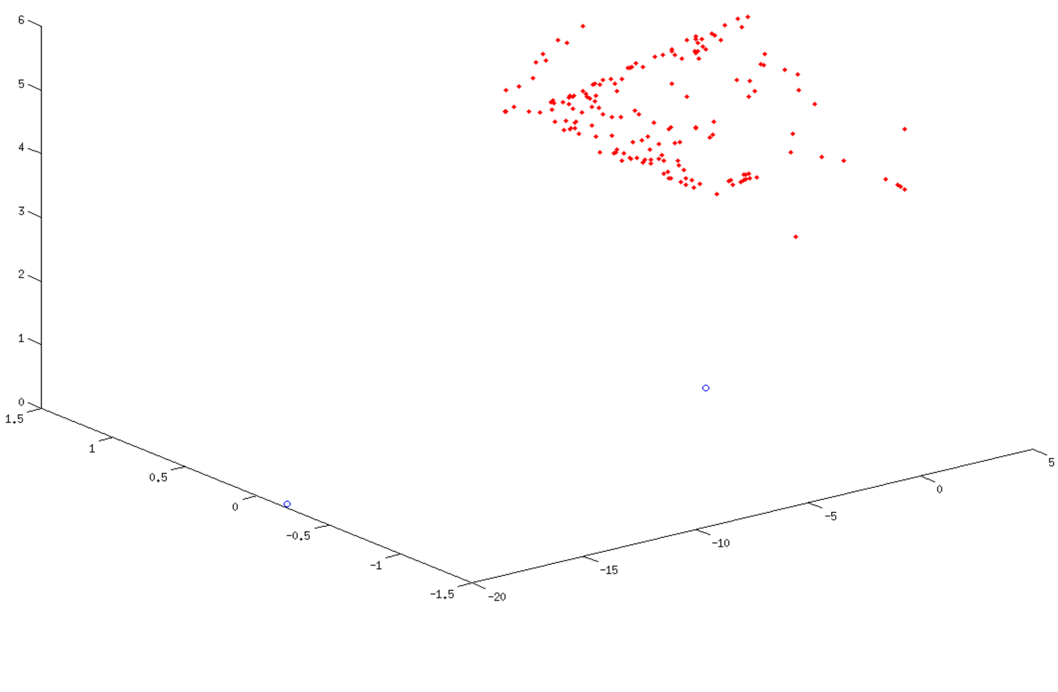




Plots of House Point Cloud:



6
5
4
3
2
1
0
-20
-15
-10
-5
0
5
1.5
1
0.5
0
-0.5
-1
-1.5



6
5
4
3
2
1
0
1.5
1
0.5
0
-0.5
-1
-1.5
-20
-15
-10
-5
0
5