Lab06

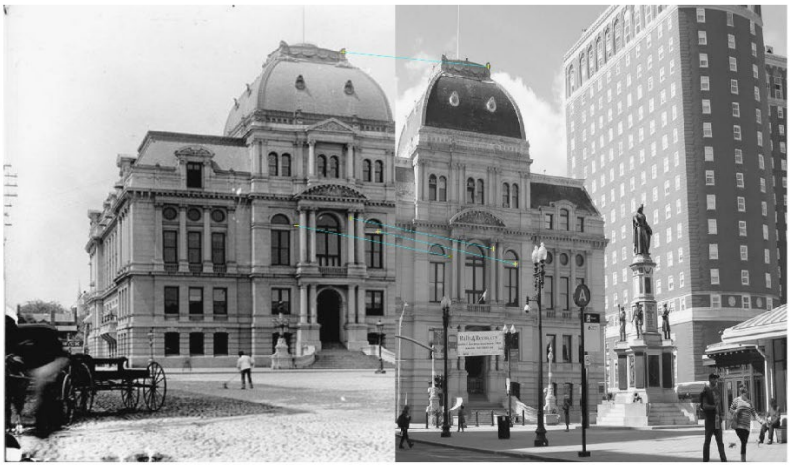
Oct 2022

Problem 1:

The results of corresponding features are shown as below:

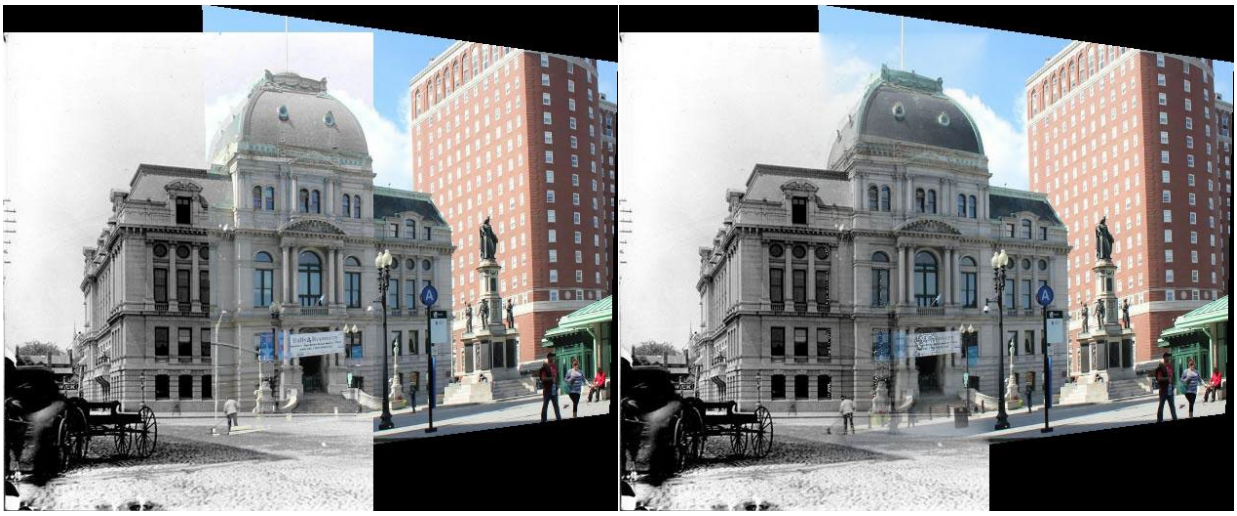
Inlier_Ratio=0.8191

Inlier_Ratio=0.3067



Inlier_Ratio=0.5715

Stitched Pictures: With 4 different blending algorithms:



Problem 2: Triplet Views

Problem 3:

Q1: compared with RANSAC, the least-square algorithm is much more sensitive to outliers. The outliers which are bad data, and we try to minimize the squared errors, the bad data will take up a large portion of the total error. In this way, the output matrix will be influenced too much by the outliers instead of expected inliers accuracy.

Q2: The four points shouldn't be linear correlated. Since the equation which we use to get H are as follows:

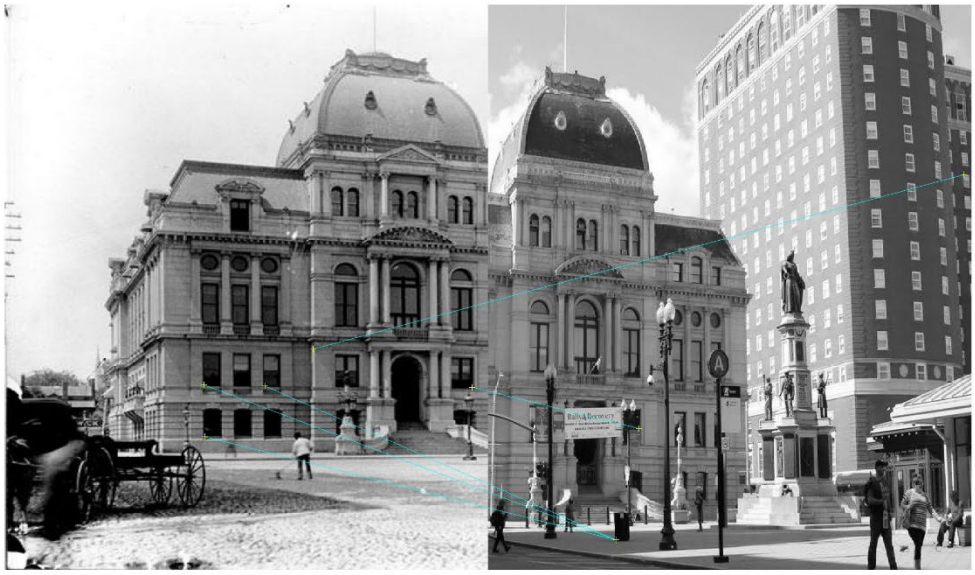
$$\begin{bmatrix} x_1 & y_1 & 1 & 0 & 0 & 0 & -x'_1x_1 & -x'_1y_1 & -x'_1 \\ 0 & 0 & 0 & x_1 & y_1 & 1 & -y'_1x_1 & -y'_1y_1 & -y'_1 \\ & & & & & \vdots & & & \\ x_n & y_n & 1 & 0 & 0 & 0 & -x'_nx_n & -x'_ny_n & -x'_n \\ 0 & 0 & 0 & x_n & y_n & 1 & -y'_nx_n & -y'_ny_n & -y'_n \end{bmatrix} \begin{bmatrix} h_{00} \\ h_{01} \\ h_{02} \\ h_{10} \\ h_{11} \\ h_{12} \\ h_{20} \\ h_{21} \\ h_{22} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ \vdots \\ 0 \\ 0 \end{bmatrix}$$

It is actually a aH=0 problem, then if the rows of left first matrix (8*8) is linear correlated, then we can get the only H. Practically speaking, every two corresponding points make a pair, and solve 2 unknown Matrix elements (8 in total, h33 normally is 1), thus 4 pairs are necessary but they have to be linear uncorrelated.

Problem 4:

I've tried features using SSD and NCC, the result are as follows: (Left: SSD; Right: NCC)

The results of these two sets are fine, but it doesn't work with the city hall set, the correspondence failed, part of the reasons I think is they share many different corner features such as the right building, pedestrian lights, and carriage. These lay much influence on the matching process, thus the inlier ratio can't represent well about the similarity.



The SSD and NCC algorithms may come out with better estimation on the homography matrix than SIFT under some circumstances. Since the corners are sharper. And comparing with SIFT, the corner features are much less, they may be less computational demanding.

NCC & SIFT

The NCC's H is more accurate which can be seen form details in some sets.