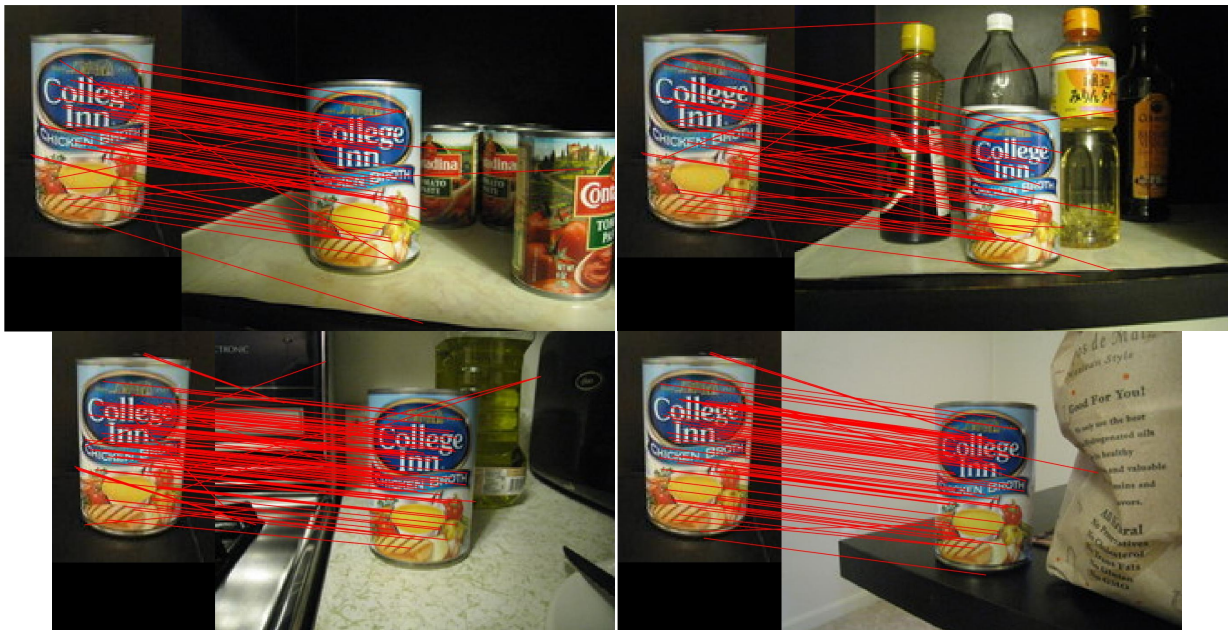
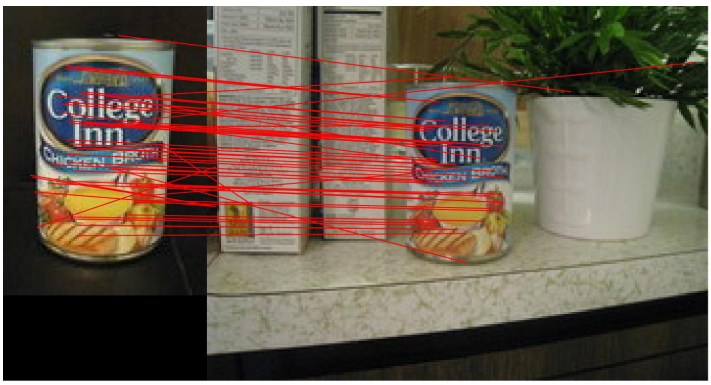
Homework 2 Write-up

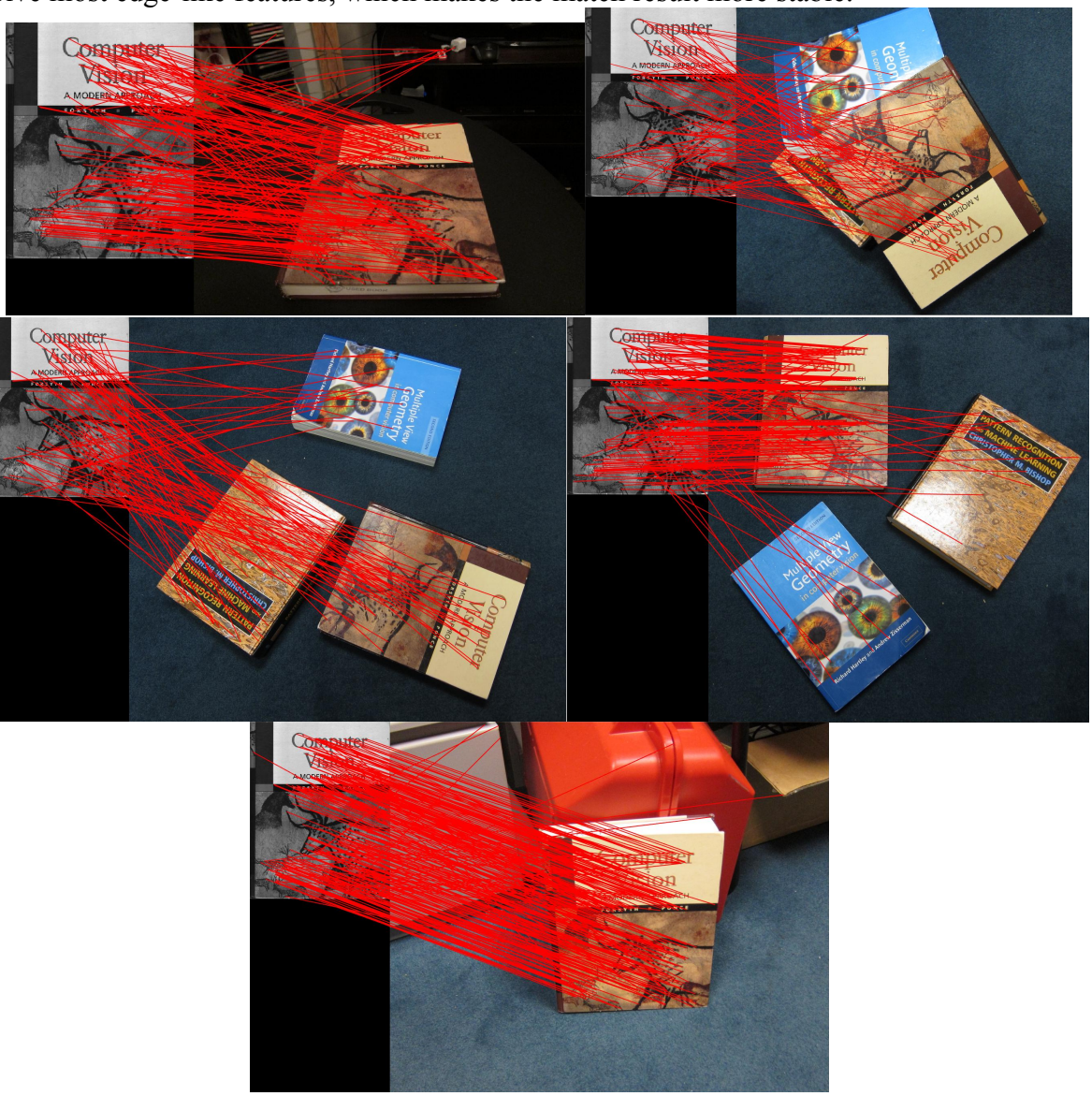
Q 1.5: Include the image with the detected keypoints in your report

Q 2.4 Save the resulting figure and submit it in your PDF report. Also, present results with the two incline images and with the computer vision textbook cover page (template is in file pf scan scaled.jpg) against the other pf * images. Briefly discuss any cases that perform worse or better.

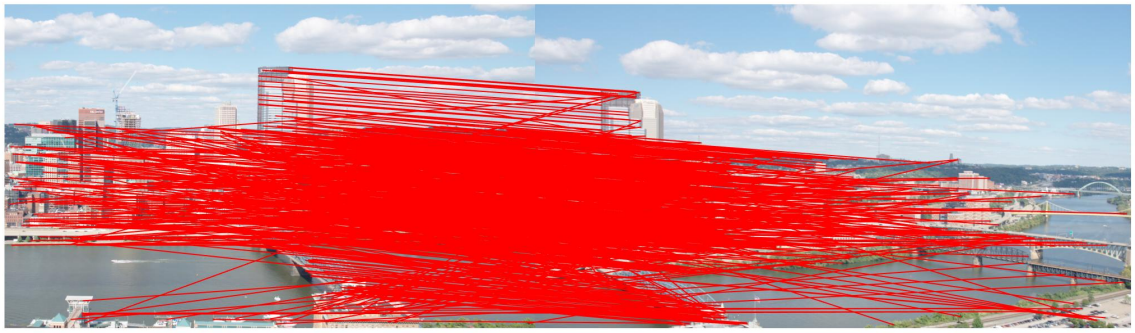




Bottle has many corner-like features so that template is easy to be matched in different scenes, especially the brand letter parts and pictures on the surface. Meanwhile, using edge suppression resolve most edge-like features, which makes the match result more stable.

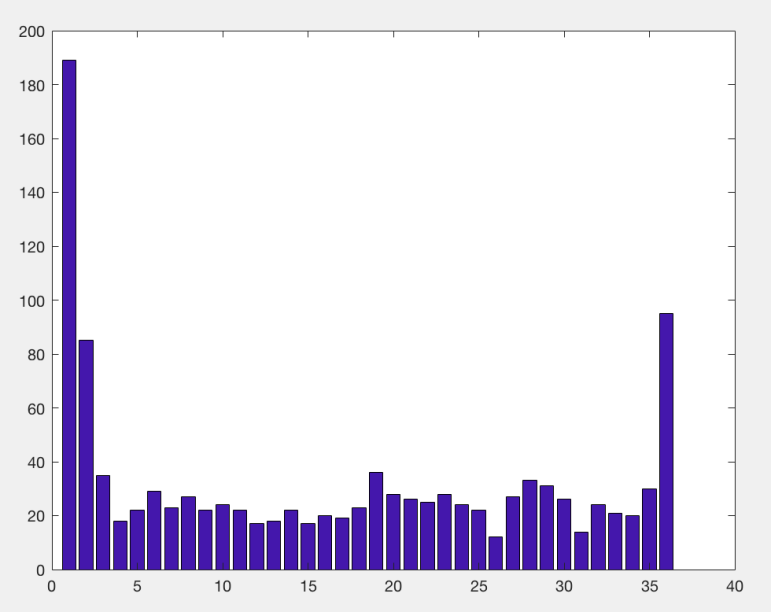


Compared to the bottle match result, text book doesn't match as well as the bottle, since text books in different scenes have rotations. Meanwhile, there are also some other different books in scenes which makes it more difficult to match feature points, because more similar textures, corners appear but coming from different objects.



The match result of Pittsburgh

Q 2.5: Take the model chickenbroth.jpg test image and match it to itself while rotating the second image (hint: imrotate) in increments of 10 degrees. Count the number of correct matches at each rotation and construct a bar graph showing rotation angle vs the number of correct matches. Include this in your PDF and explain why you think the descriptor behaves this way. Create a script briefRotTest.m that performs this task.

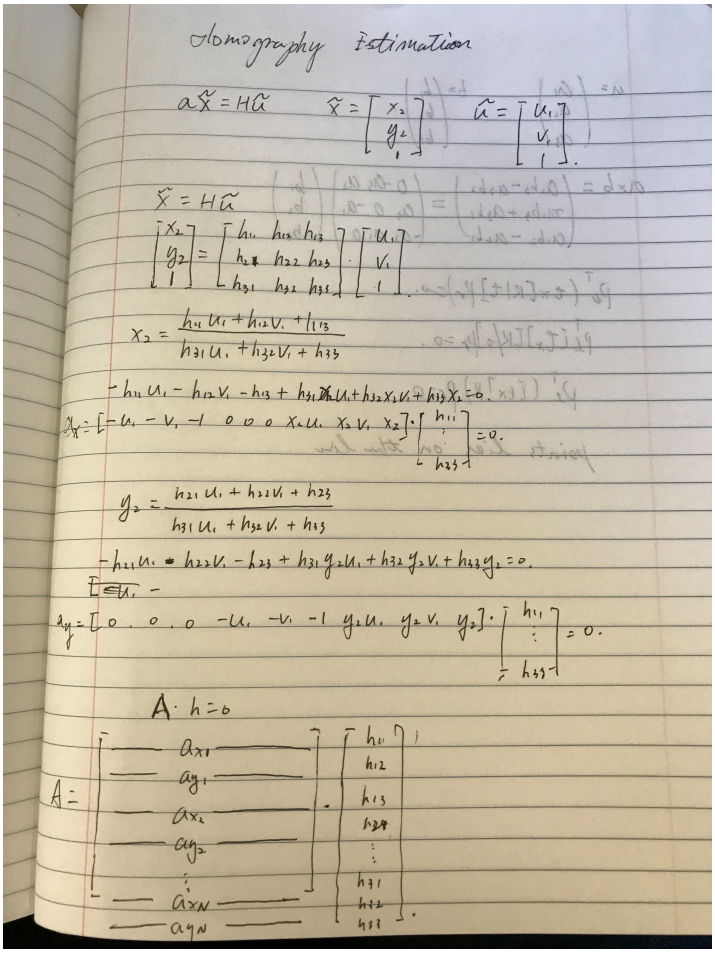


With the increments of rotation, the number of matching result decreases dramatically. The reason is that, in the making brief-descpritor procedure, our compareA and compareB are

pre-initialized with no adaption to the rotation. As the result, descriptors cannot represent complete neighbor features after rotation.

Q 3.1

(a) Given the N correspondences across the two views and using Equation 8, derive a set of 2N independent linear equations in the form:



(b) How many elements are there in h?

9 elements.

(c) How many point pairs (correspondences) are required to solve this system? Hint: How many degrees of freedom are in H? How much information does each point correspondence give?

4 pairs of correspondence to resolve this equation, and H has 8 degrees of freedom.

(d) Show how to estimate the elements in h to find a solution to minimize this homo-geneous linear least squares system. Step us through this procedure. Hint: Use the Rayleigh quotient theorem (homogeneous least squares).

1 Get a new matrix from A' * A;

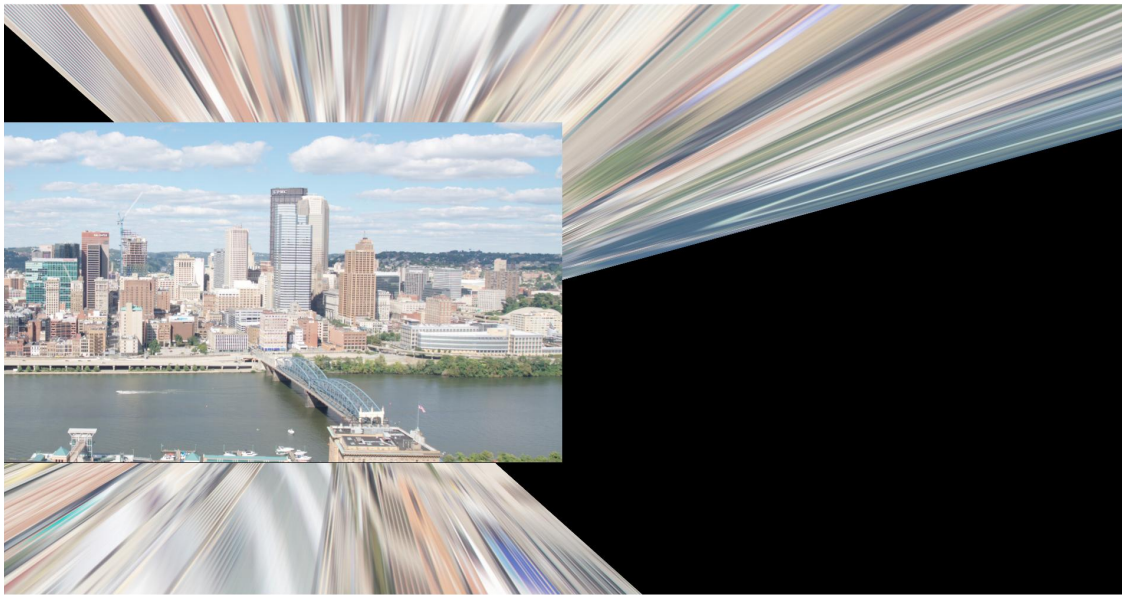
2 Find the eigenvalues λ of the new matrix;

3 Find the smallest eigenvalue λs;

4 Get the corresponding eigenvector which contains in h ;

Q 6.1 Stitching image with clipping

Q6.2 Stitching image without RANSAC



Q 6.3 Panorama with RANSAC