

1.3

The threshold value that I chose when finding matches between the box image was 0.7. This gave me many accurate matching points with only 2 outliers. I chose it by starting at a high threshold value ~1.0 and decreasing this value until there were < 10 outliers. It's important to choose a threshold value carefully in order to receive enough matching points (higher threshold) while limiting the number of outliers (lower threshold). This becomes increasingly important when matching images where the visual properties become more repetitive because we want the most precise matches while also getting as many matches.

1.4

BASMATI

Without RANSAC = 129 matches

Threshold = 0.9)



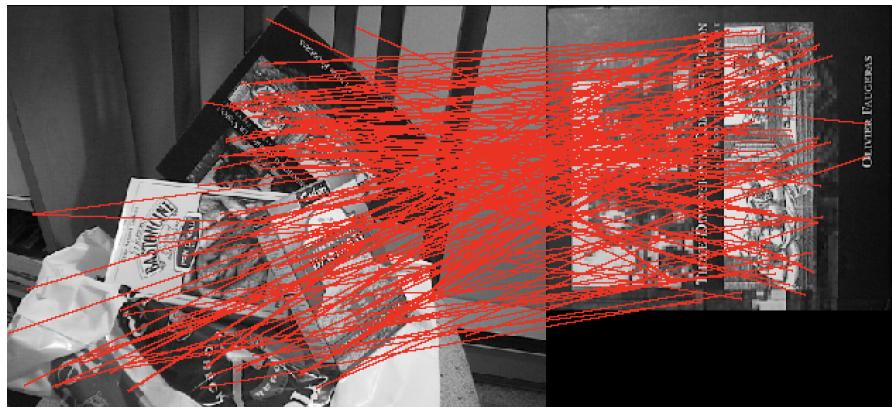
With RANSAC = 26 matches

Threshold = 0.9, Orientation_agreement = 30, Scale_agreement = 0.5



BOOK

Without RANSAC = 171 matches



With RANSAC = 41 matches

Threshold = 0.9, Orientation_agreement = 60, Scale_agreement = 0.1



(1 easily visible outlier)

BOX

Without RANSAC = 147 matches



With RANSAC = 37 matches

Threshold = 0.9, Orientation_agreement = 10, Scale_agreement = 0.1



Also include in a PDF a paragraph summarizing the effects of consistency checking and the degree to which it allowed you to raise the matching threshold.

In summary, consistency checking has enormous benefits in object detection in 3D space by allowing for higher threshold values to be achieved while filtering for the most precise matches. Some interesting things I found when experimenting with the threshold, orientation, and scale values that go into the RANSAC process were:

- When the basmati, book, and box image are being compared to the scene image, if their orientation is very similar (in box's case) to the orientation in the scene we can drop the orientation_agreement very low. Although, we can also keep this value higher (even as far as 300) and achieve the same results. This is because the box has very distinct features. The difference was clearly seen when testing with the book image, which is rotated 40-70 degrees. Changing the orientation_agreement on this image caused significant changes because of this rotation (too low = the rotated image wasn't found, too high = unwanted matches were counted).
- The same idea correlates with scale, where the book and box could find a lot of good matches with a small scale_agreement because they have similar size in the scene. Whereas the basmati had issues with scale, where exceeding 0.5 caused incorrect matches, likely because the scale is much different for this image in the scene.
- Overall, the threshold value you're able to achieve depends on the changes in orientation and scale of the image you're trying to find in the scene. It is however safe

to say that using RANSAC certainly aids the increase of the threshold value while maintaining accurate matches, resulting in better object detection. I was able to raise the matching threshold approximately 0.3 for each image.

2.4

When num_iter is increased, the number of RANSAC iterations increases and with this comes greater accuracy between point matches. Having a greater chance at accurate matches means that the resulting panorama will have images patched next to the closest resembling patch. This can be visualized in the three images below (with tol = 10). An interesting artifact can be seen in the second image (num_iter = 10) where on the far right side of the image, the patch bends toward the middle of the image, away from the right edge. I thought this was interesting considering the rest of the image is similar to when num_iter = 100

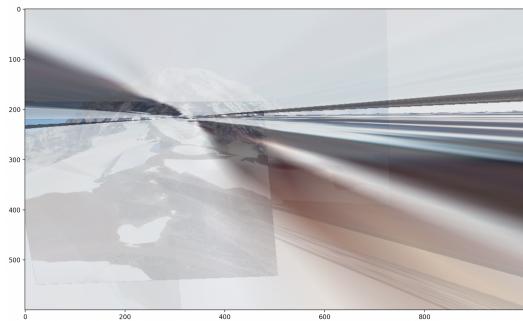
num_iter = 100, tol = 10



num_iter = 10, tol = 20

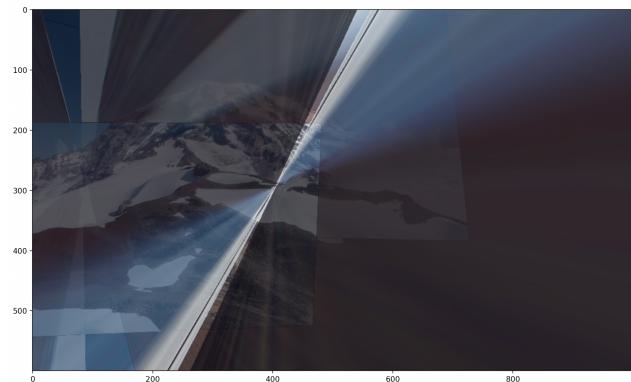


num_iter = 5, tol = 30

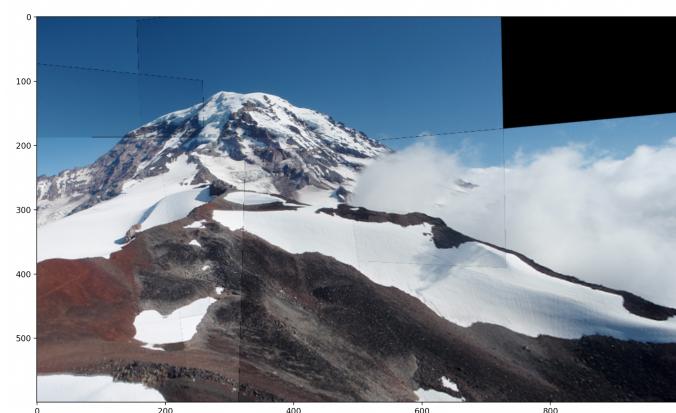


When tol is increased, the number of matches that are far away from each other increases. Meaning if the tolerance is high, our RANSACHomography function will include matches that are far apart from each other and skew the homographic matrix for when the image patches are being “wrapped” together. Overall, keeping the tolerance low (below 20) should provide accurate results.

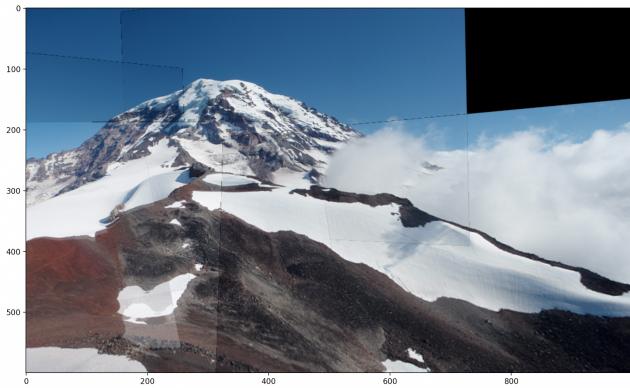
Num_iter = 50, Tol = 100



Num_iter = 20, Tol = 5



Num_iter = 200, Tol = 1



2.5

Fountain40



Garden034



IKB365

