COL780
Assignment 2

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1 Image Preprocessing

Images were first resized to half their size and converted to grayscale images. Then, some preprocessing steps were applied as mentioned below

1.a Contrast Adjustment

α value was set to be 1.25 and β value was set to be 0.

Figure 1: Original Grayscale Image

Figure 2: Contrast Adjusted Grayscale Image

1.b Noise Reduction

The next step in pre-processing taken was to reduce the noise using a Gaussian Blur. The kernel size was chosen to be 5x5 with the standard deviation as 1 was chosen empirically.

Figure 3: Blurred Image with Gaussian Filter

2 Image Registration

The next steps involved the identification of keypoints and generating the descriptors.

2.a SIFT

The keypoints identified by the SIFT algorithm were as follows

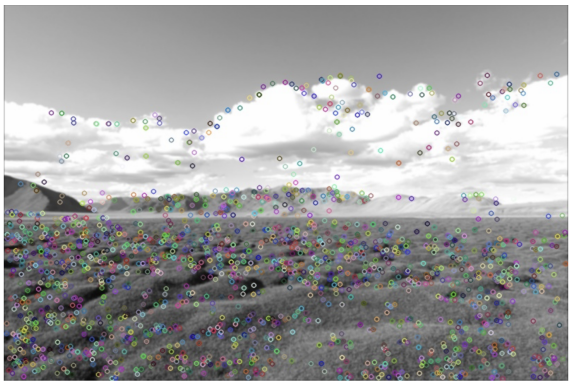

Figure 4: SIFT keypoints for blurred image 1

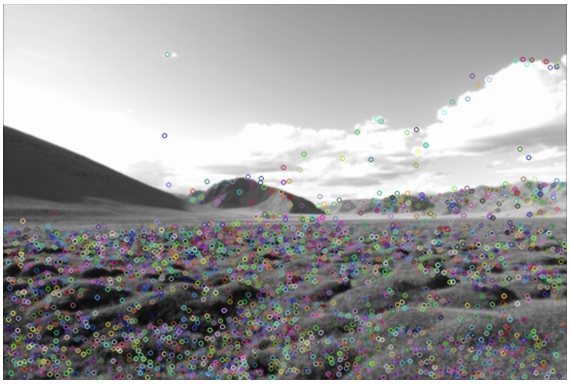

Figure 5: SIFT keypoints for blurred image 2

2.b Keypoint matching using KNN Matching

The keypoints were then matched using KNN matching with K value set to 4. Lowe's ratio test was also used and the threshold set was 0.6

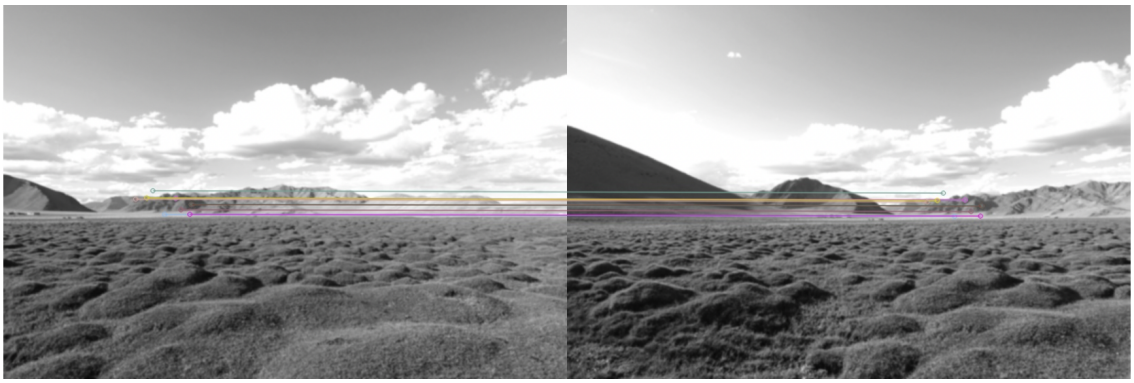

Figure 6: Matching Keypoints

2.c Projective Transform

Homography matrix was then calculated using SVD. Using this homography matrix, the a projective transformation was applied and then the other image was sticthed.

Figure 7: Panorama of the two images

3 Panorama Creation from Images

Once the panorama was created till the previous step, a new image was loaded and then the keypoints were identified for both the previous panorama and new image. Once keypoints were calculated and descriptors were calculated these two were stitched similarly. These steps continued till the end. One big concern for this method is how the images were stored in the file, if they weren't ordered properly this method fails as we will see below.

Figure 8: Panorama after three ordered images were stitched

Now this fails after the fourth image, my idea is it's because of the unorderedness of the next few images, not many keypoints get matched hence the failure.

Figure 9: Panorama after trying to stitch all images

4 References

1) Implementing SIFT in Python: A Complete Guide (Part 1) (https://medium.com/@russmislam/implementing-sift-in-python-a-complete-guide-part-2-c4350274be2b) 2) Implementing SIFT in Python: A Complete Guide (Part 2) (https://medium.com/@russmislam/implementing-sift-in-python-a-complete-guide-part-2-c4350274be2b) 2) Chatgpt
3) Wikipedia
4) OpenCV
5) GeeksForGeeks