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# Advanced topics in Compute Vision

A6: Image Stitching

The objective in this practice is to automatically stitch two images that are taken from the same centre of rotation, by first extracting SIFT features, then acquiring the matched features between left and right images, filtering the matches to get the inliers, performing a RANSAC and finally applying the mosaic function.

NOTE: attached is a commented code that clarifies each step performed

1. **Computing interest points in both images**

In order to extract the features in both of the images in a certain pair, the SIFT code is applied to each image. In the Figures below, some random 100 feature points are displayed in order to visualize what the SIFT algorithm may detect as potential features.
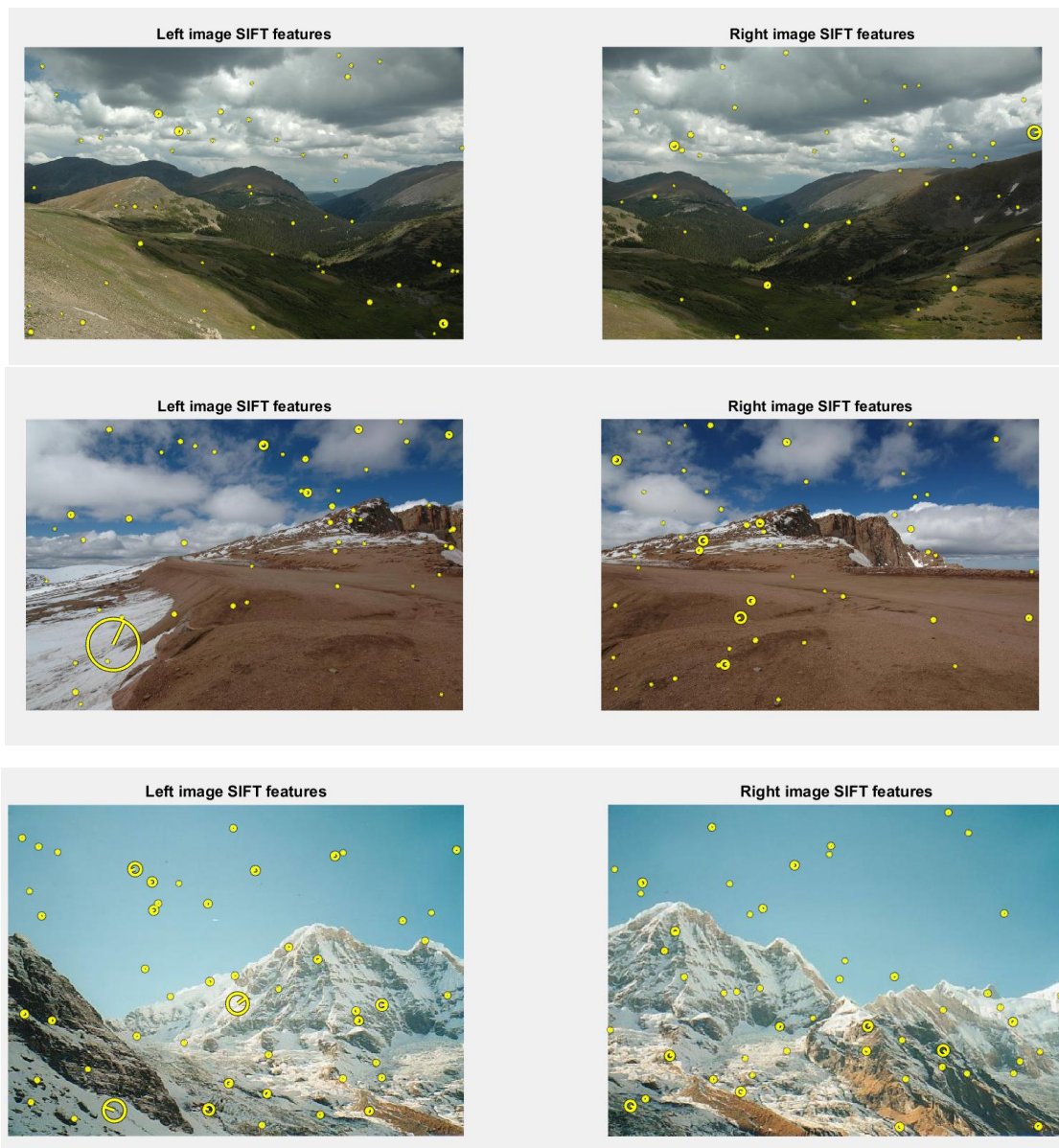
2. Estimating potential matches

IN order to find the potential correspondences between the left and right SIFT features, the following code has been used, where the function vl_ubcmatch() returns the matches between the left and right SIFT features, as well as the Euclidian distance between them:

```matlab
[ind_match, distance]=vl_ubcmatch(da,db);  %estimating potential matches


[sorted, ind_sort]=sort(distance,'descend');% Sorting the potential
matches
ind_match=ind_match(:,ind_sort);

distance=distance(ind_sort);
match_left=fa(1:2,ind_match(1,:));
match_right=fb(1:2,ind_match(2,:));
```

Displayed below are the set of potential matches before filtering them:

Set of potential matches

Set of potential matches

Set of potential matches
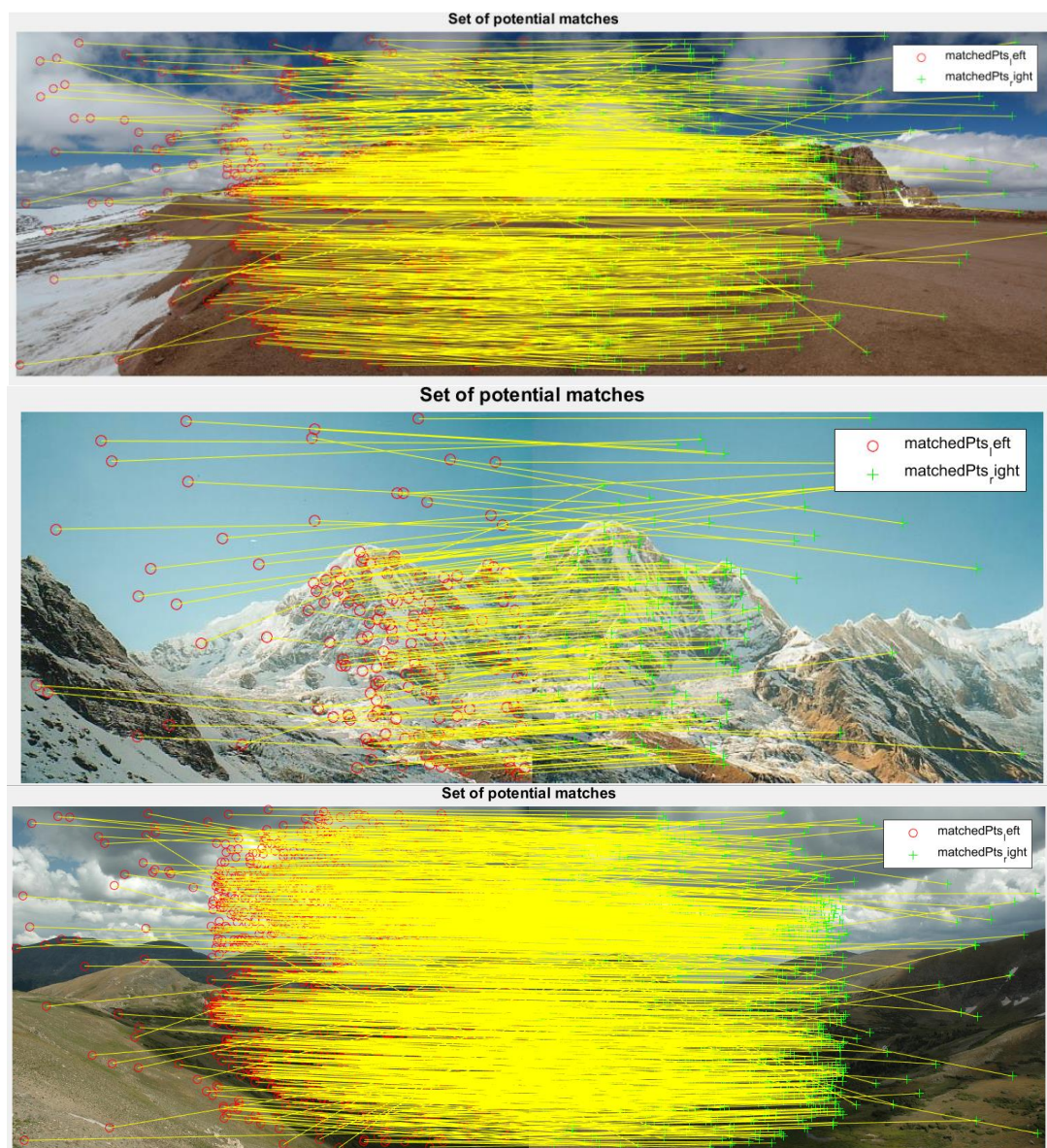
3. Estimating the homography relating the two images using RANSAC

In order to filter out the outliers, RANSAC method is used. Within the RANSAC, the homography matrix (using DLT technique) is performed using four random matches from the obtained set of matched features. The iterations needed depend on the RANSAC parameters chosen. At the end, the H matrix with the biggest number of inliers is kept for the next steps. In the below figures are displayed the resulting inliers after filtering the matches.
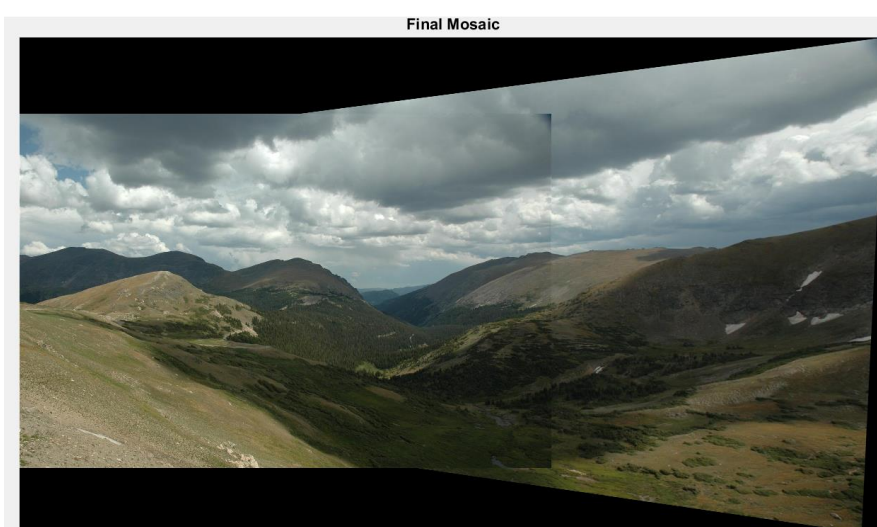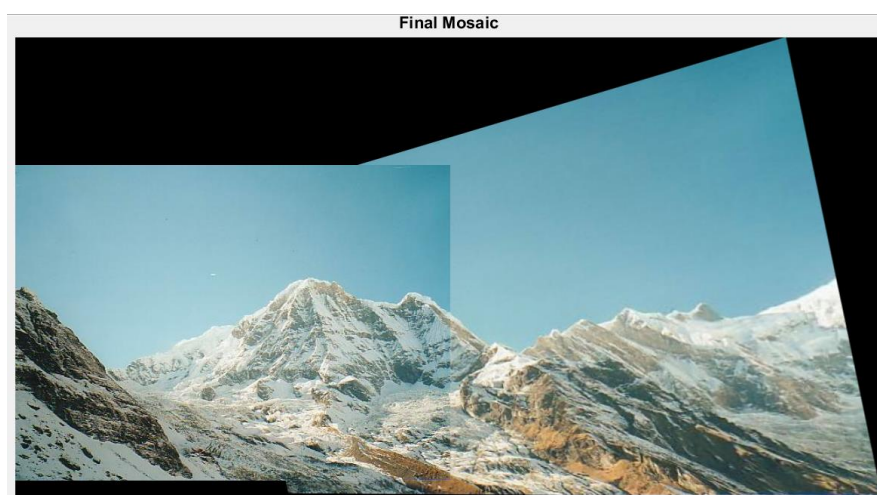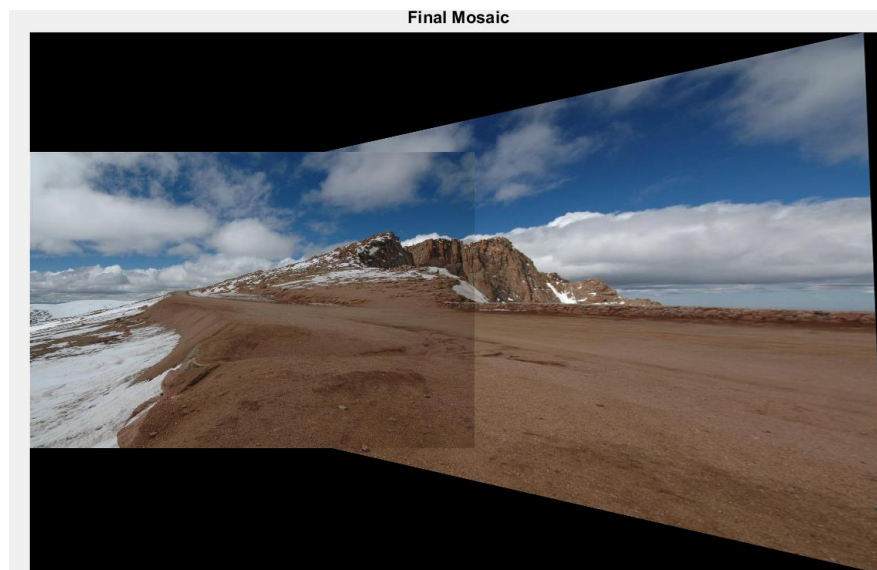
RANSAC parameters:

```
e=0.4; p=0.99; s=6;
n=ceil((log(1-p))/(log(1-(1-e)^s))); % Number of iterations
```
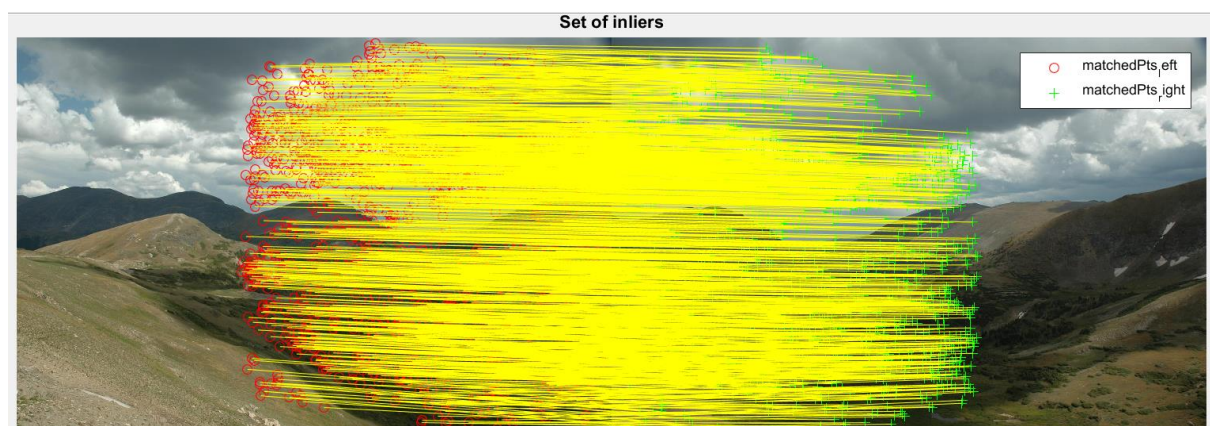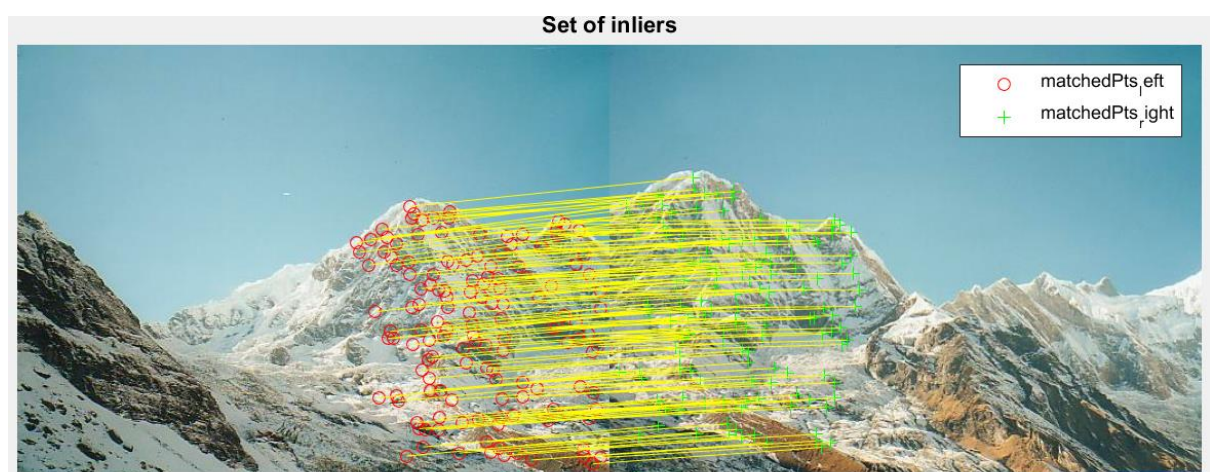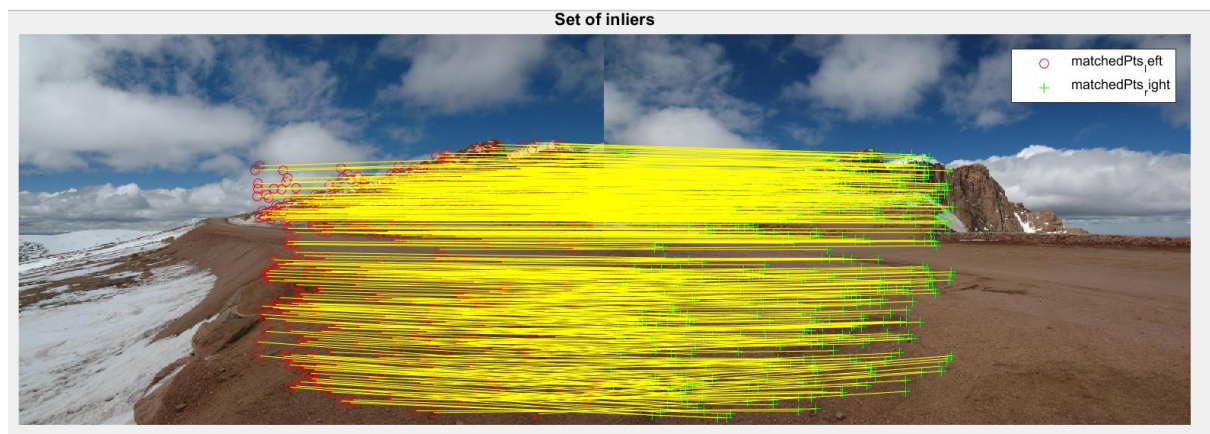
4. Final Mosaic

The final step is to stitch the images using the make_mosaic() function. Below are displayed the final mosaic images of the 3 different pairs of images:

Final Mosaic

Final Mosaic

Final Mosaic

END