Assignment 4

Computer Vision
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Exercise 1

a. In order to complete this point and implement the matching of mutually nearest neighbors using normalized cross-correlation:

- I computed the mean for each patch

- I applied the equation for the normalized cross-correlation.

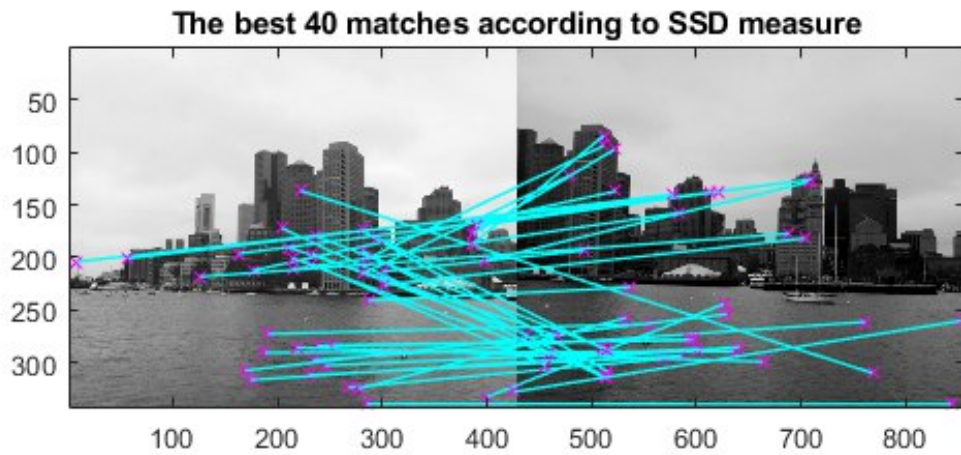- Lastly I sorted the matches in order to find the best ones.

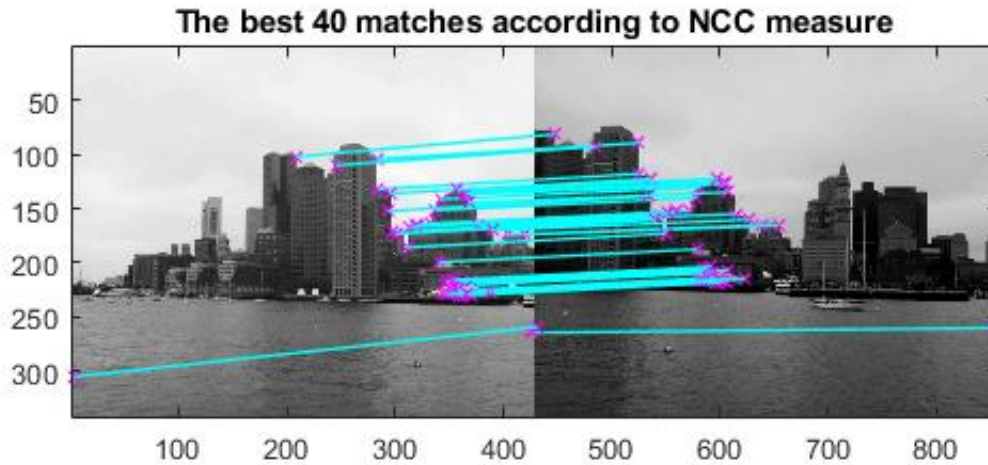Figure 1: The best 40 matches according to SSD measure

Figure 2: The best 40 matches according to NCC measure

b. Using normalized cross correlation I got 295 correct points on 368 points, using sum of squared differences 49 correct points on 115.

c. The NCC guarantees better results since it has a score between [-1 and 1]. This feature makes it easier to handle in some high level application and images taken with different exposures.
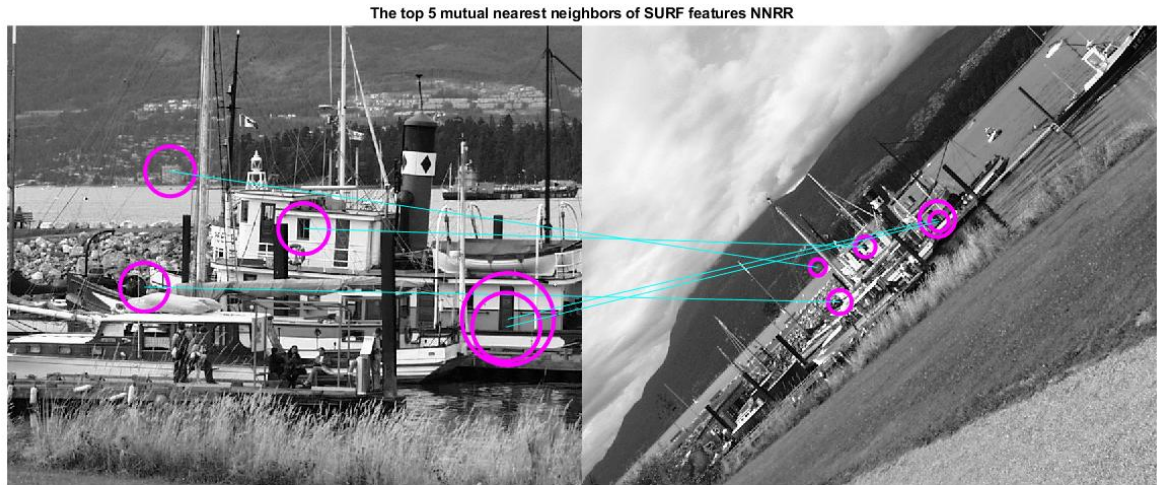
Exercise 2

Figure 3: The top 5 mutual nearest neighbors of SURF features

SURF (Speed Up Robust Features) interest point detector and descriptor, it is preferred to Harris corners detector because it is scale-invariant. Harris corner are rotation-invariant, which means, even if the image is rotated, we can find the same corners. It is obvious because corners remain corners in rotated image also. Since a corner may not be a corner if the image is scaled Harris corner is not scale invariant. It do not work for the image example in exercise 2 because it is scaled. Nevertheless, in the case we are dealing with images without scaling, Harris corners method can reach the same results of SURF, but with a lower computational time.

Exercise 3

For implementing the missing part of the third exercise I used the Matlab function imfilter between the image and every level of the laplacian pyramid. As shown in the images the result obtained is similar to the one provided by the Matlab tool, as expected. We can see in the left part of the second image some different matches but in the central part the matches are quite similar.
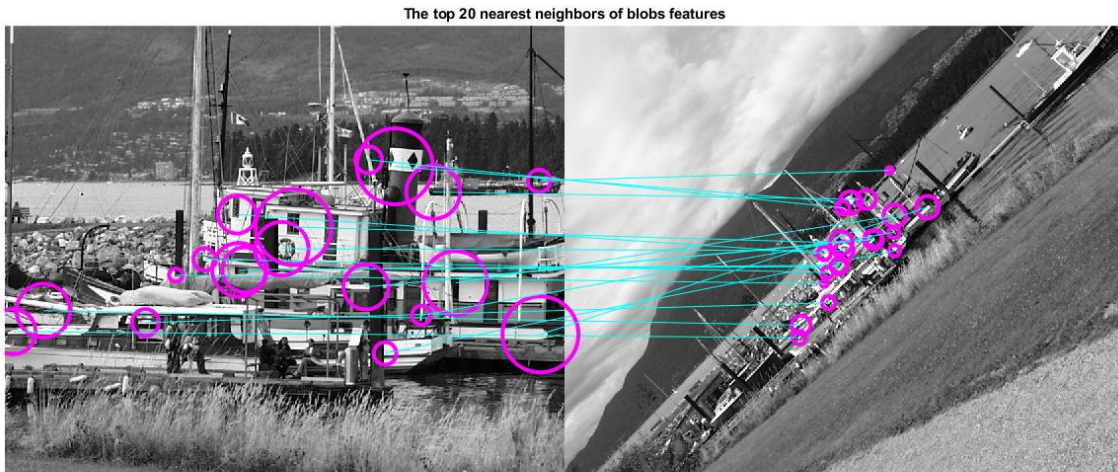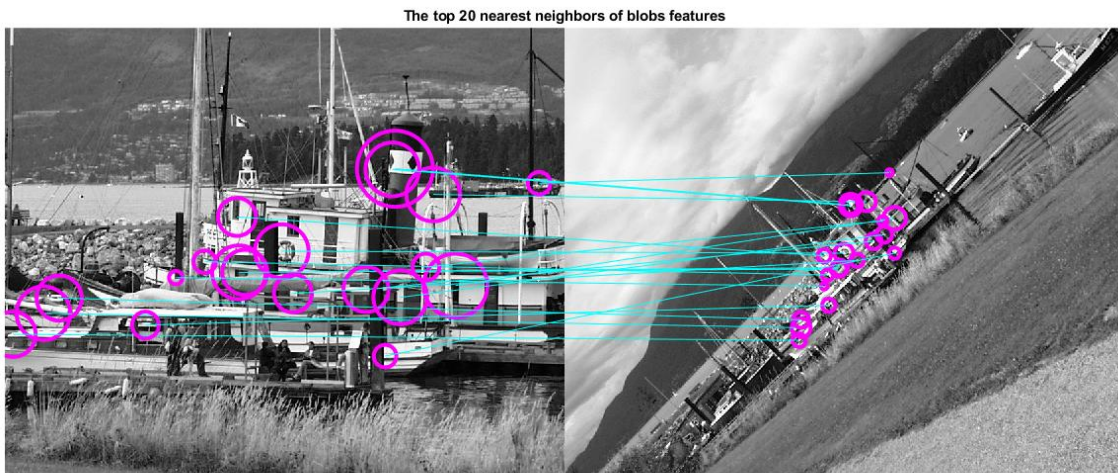

Figure 4: Results provided by the Matlab toolbox

Figure 5: Results provided by our implementation