ETH Zurich, D-INFK

Computer Vision: Assignment 1

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October 1, 2017

1 Feature extraction

I have implemented the feature extraction step basically the as described in the exercise sheet with addition of the Gaussian blurring of the image derivatives. In order to avoid multiple for loops in MATLAB, I have precomputed the sums of the blurred I_x^2, I_y^2 and I_{xy}. I choose the threshold of 0.005 for Harris response measure.

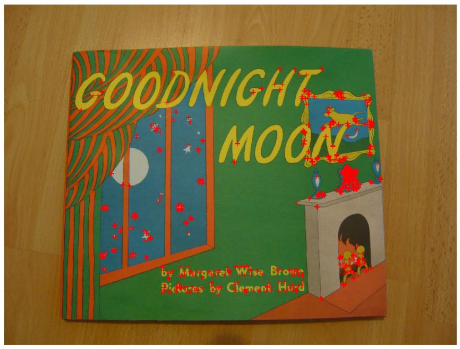
1.1 Non-maximum suppression comparison

In Figures **??** and **??** are the Harris corners before and after non-maximum suppression. As we can notice, when non-maximum suppression is not used, the areas of dense keypoints get even more dense and the number of total keypoints in the image increases drastically. With no suppression, the number of keypoints is around 11k and 31k for the 2 images respectively and with the suppression the number of keypoints drops to around 430 and 720 respectively.

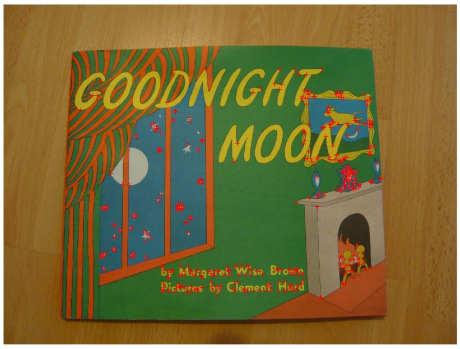
1.2 SIFT comparison

I have ran the SIFT library with $PeakThresh = 0.02$ for both images. I have chosen this value empirically, so that the images are not too crowded with the keypoints. In Figures **??** and **??** are the comparisons of my implementation of Harris corner detection and the vlfeat SIFT implementation.

I have got the feeling that SIFT has found many points that do not represent corners, but rather edges. On the other hand, Harris corner detector had way less of the key points on the edges.

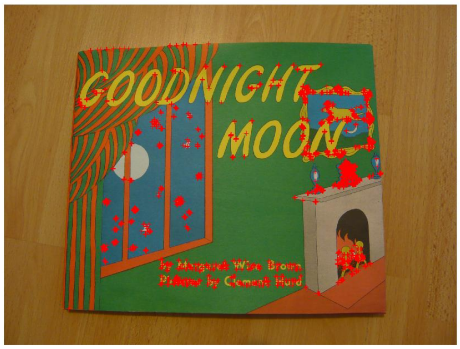


(a) No suppression

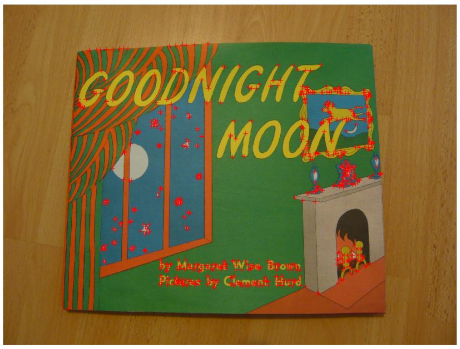


(b) With suppression

Figure 1.1: Non-max. suppression compariosn for image 1

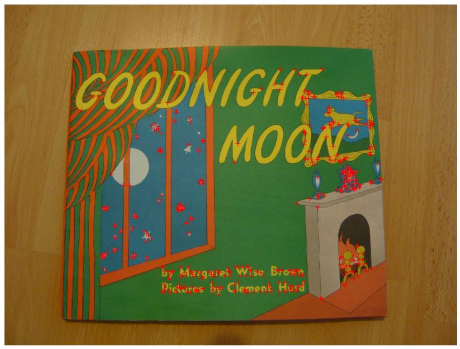


(a) No suppression

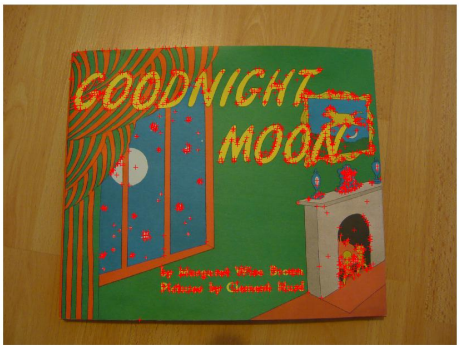


(b) With suppression

Figure 1.2: Non-max. suppression compariosn for image 2



(a) Harris



(b) SIFT

Figure 1.3: Harris vs SIFT corner detection for image 1.

(a) Harris (b) SIFT

Figure 1.4: Harris vs SIFT corner detection for image 2.

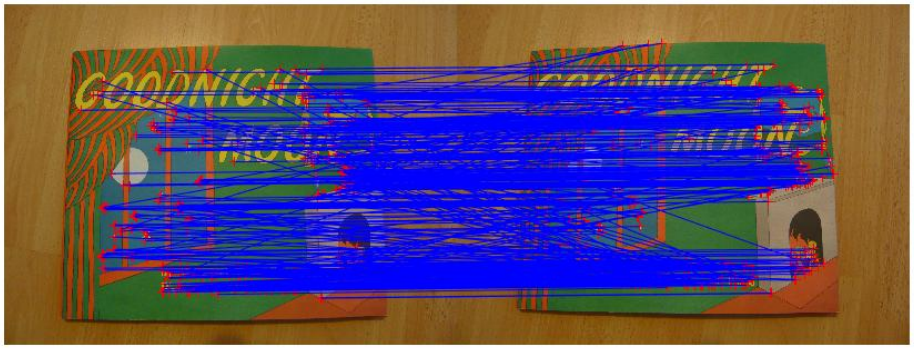


Figure 1.5: Harris matches

1.3 Feature matches

In figures **??** and **??** I have plotted the matched keypoints obtained by both methods. Obviously, since SIFT has obtained more keypoints on both images, it has more matches than Harris corner detector. Also the matches of the SIFT descriptors are more accurate. On the other hand, the simple matching algorithm that I have implemented has also a pretty good accuracy with only small fraction of keypoints that are not matched correctly.

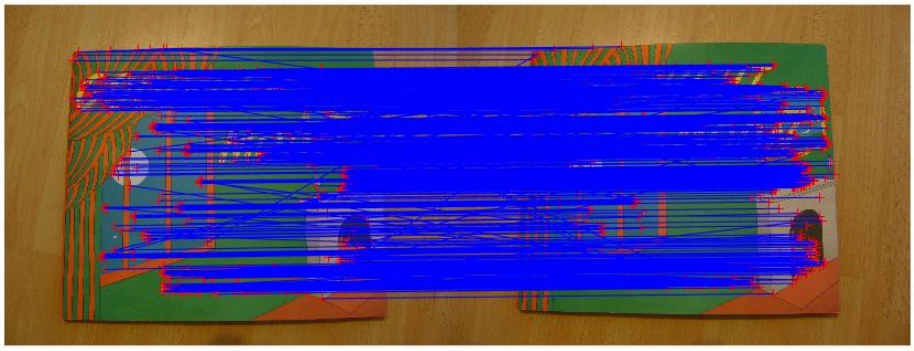


Figure 1.6: SIFT matches