

Assignment #2

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In this assignment, I used MATLAB 2013b to complete it. The steps and results are as follows.

1. The Arrange of This Assignment

According to assignment requirement, I divided the assignment into 6 steps. Its flow chart is shown in figure 1.

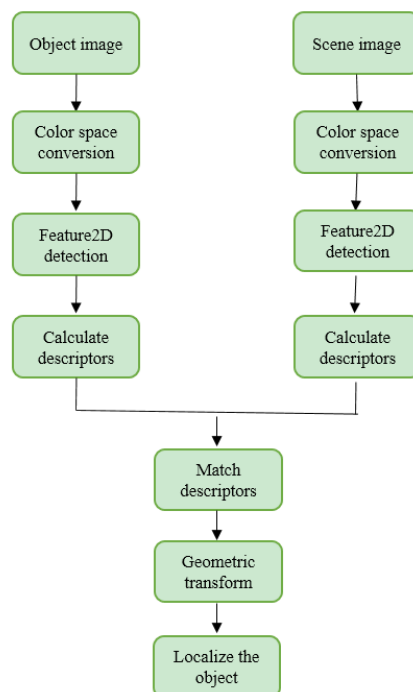


Figure 1: flow chart of assignment

2. Operation Steps

2.1 Input image and color space conversion

Input two color images: object image and scene image. Then converse color space of the images from RGB to GRAY. The result of this step is shown in figure 2 and figure 3.

2.2 Features2D detection

Detect the keypoints of two gray image shown in figure 2 and figure 3. There are lots of Features2D detection algorithms, such as SIFT, SURF, and so on. I tried them

and finally I choose SURF, because there is a function named “detectSURFFeatures” in MATLAB toolbox. After doing this I used another function named “selectStrongest” to show the keypoints. The result can be seen in figure 4 and figure 5.



Figure 2: gray scene image

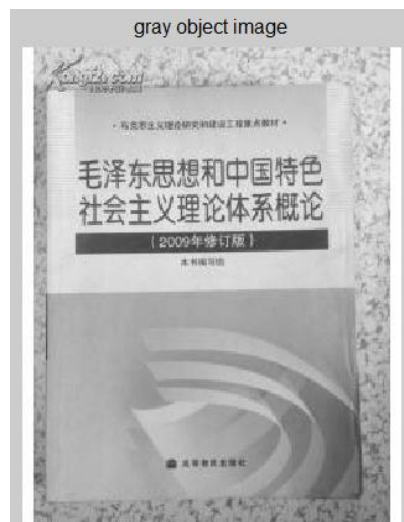


Figure 3: gray object image

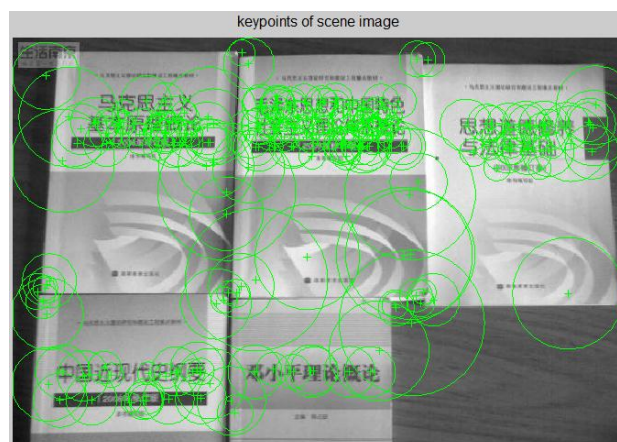


Figure 4: keypoints of scene image



Figure 5: keypoints of object image

2.3 Calculate descriptors

Using function “extractFeatures” to calculate descriptors for each keypoints gotten in last step.

2.4 Match descriptors

There is a function named “matchFeatures” in MATLAB toolbox specially used for matching features. Another function named “showMatchedFeatures” can be used to show the matching result. The result is shown in figure 6.



Figure 6: image of matched points

2.5 Geometric transform

In the result of last step, we can see that there is a mismatch between object image and scene image. Here I used a function “estimateGeometricTransform” to eliminate the error. In this function, there are three transformations to choose, ‘similarity’, ‘affine’, and ‘projective’. I choose ‘projective’ after some comparison. The result can be seen in figure 7.

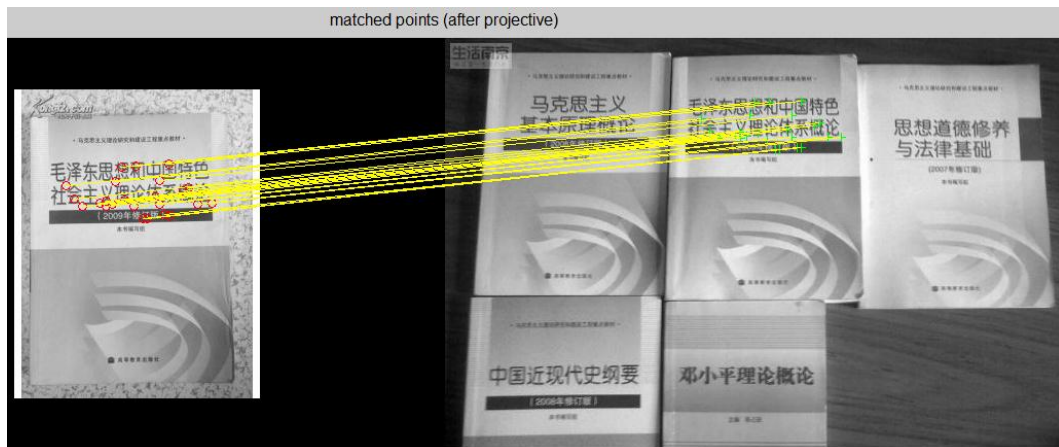


Figure 7: matched points (after geometric transform)

2.6 Determine object's position

First, I draw a box according to the size of object image. Then I used this box to wireframe the object in the scene image. The final result is shown in figure 8.



Figure 8: detection result image