ENGN 1610/2605 Image Understanding

Lab #5 Feature Descriptors and Correspondences

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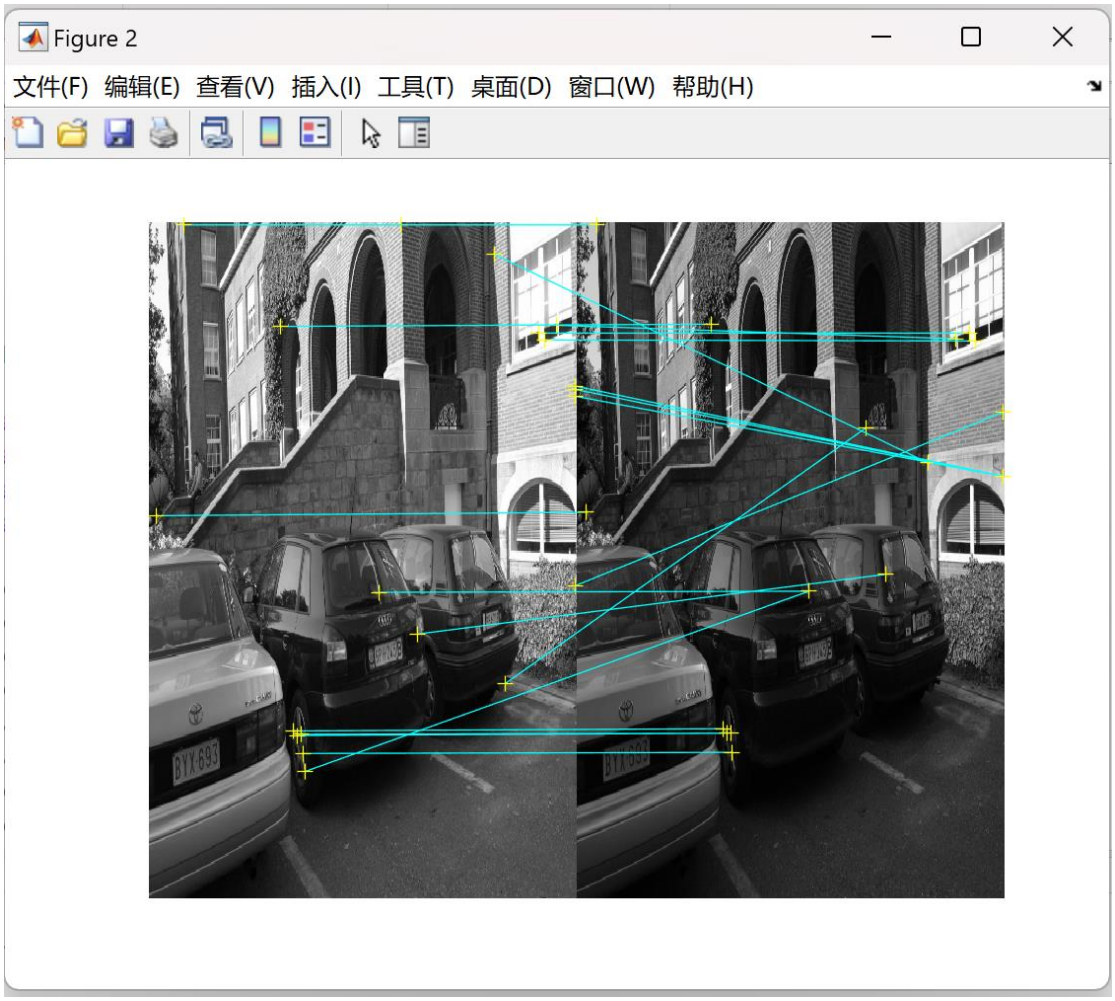
Problem 1. Feature Descriptors and Matching

The code for this result is in "P1.m" file.



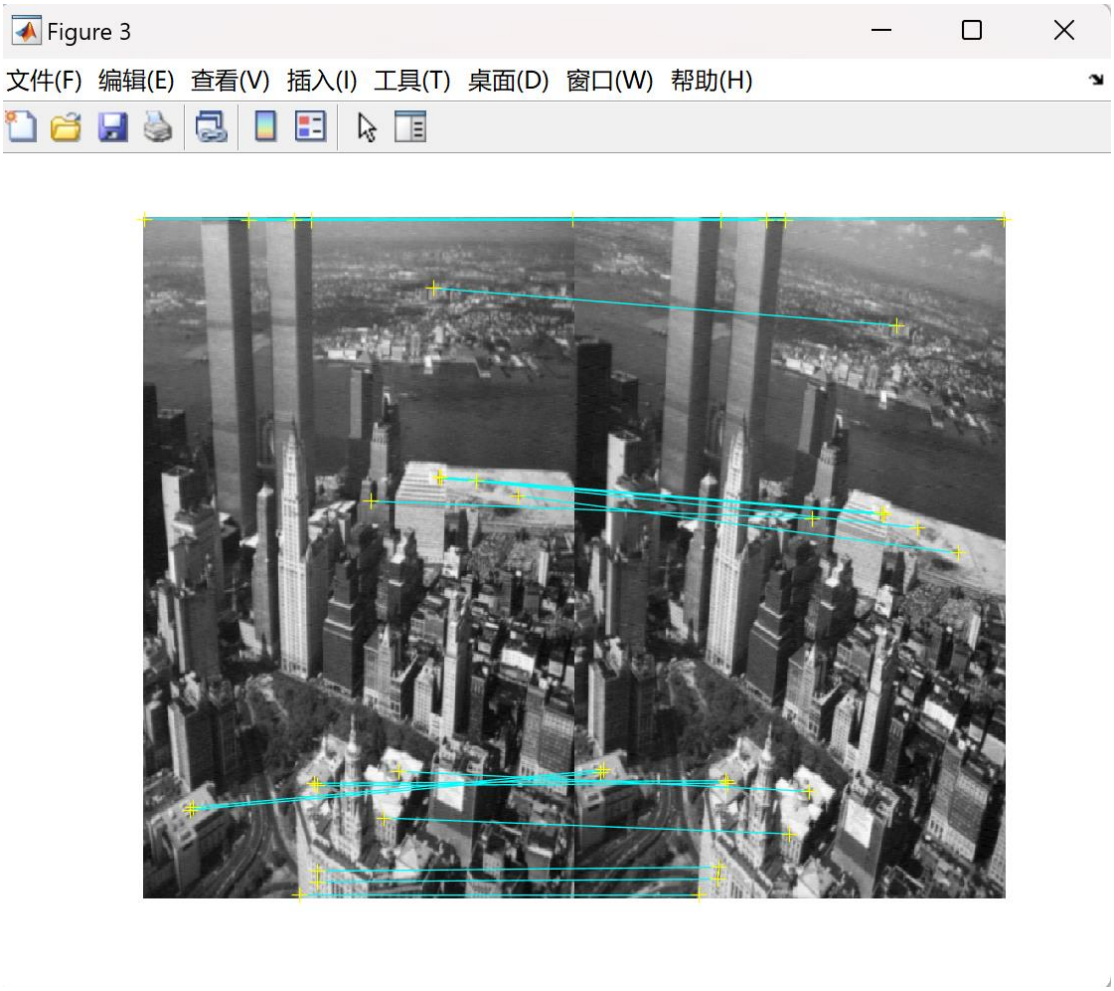


Figure 3
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)


Figure 4
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)

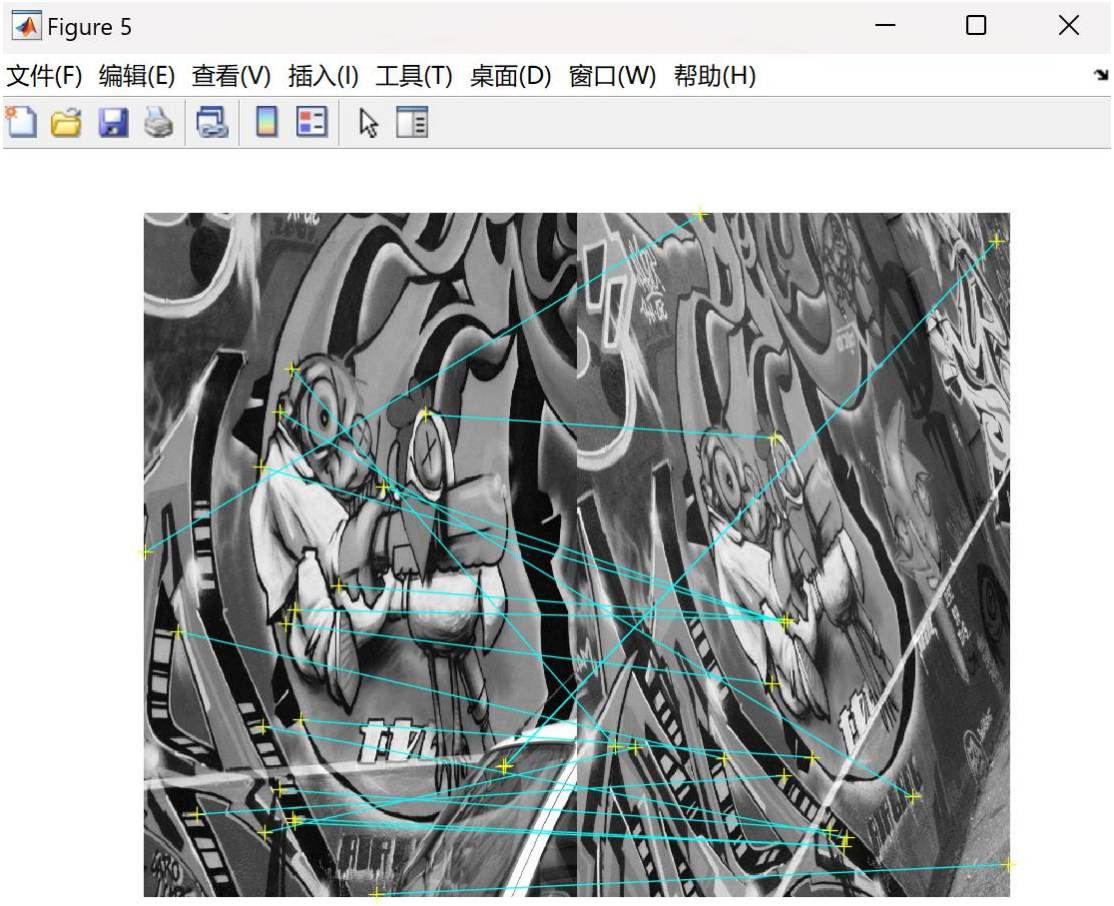
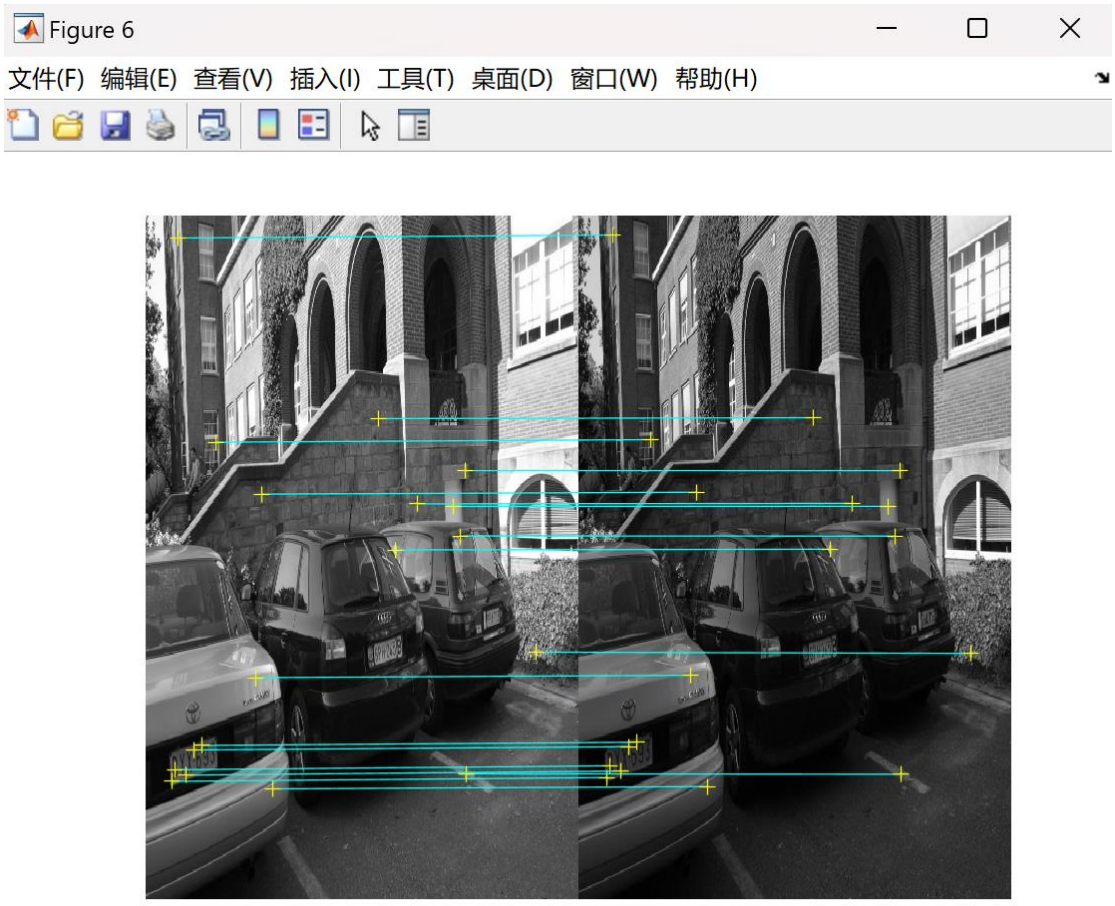


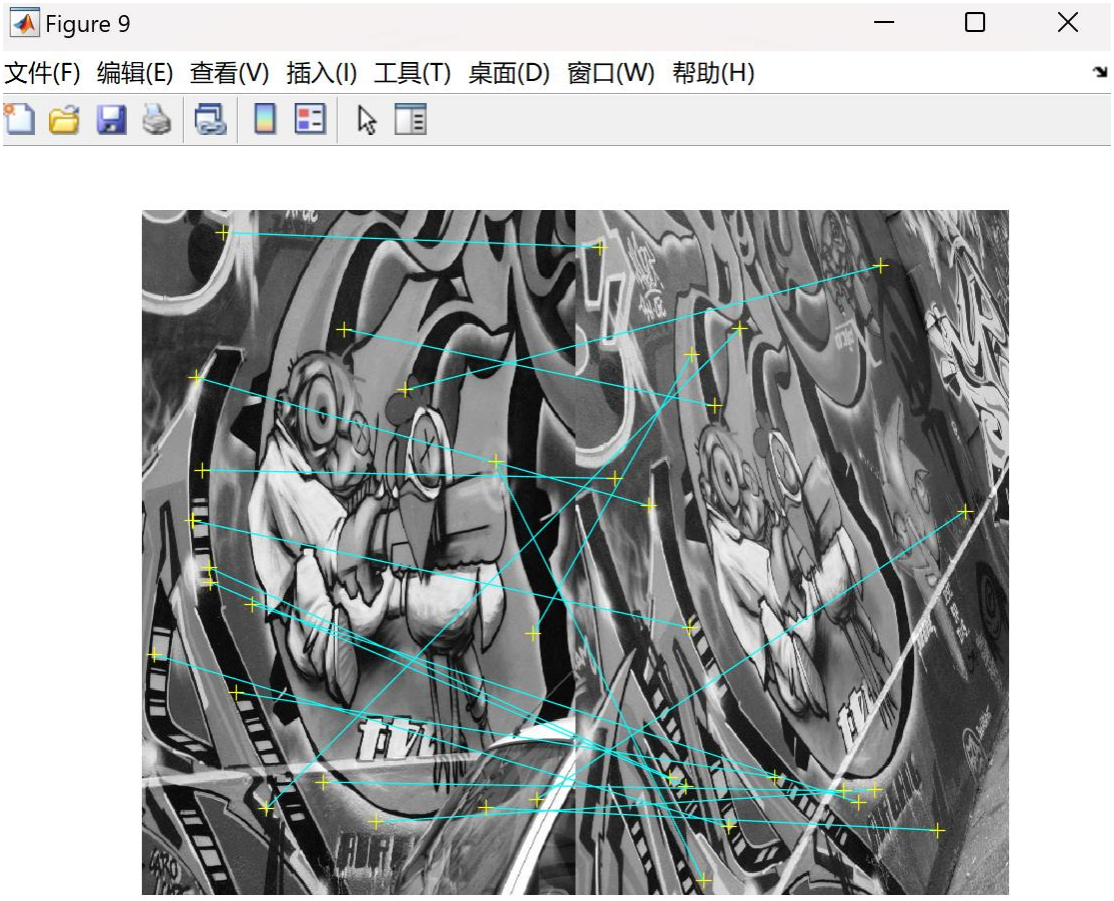
Figure 5
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)



SIFT

SIFT

SIFT



SIFT

```
SSD accuracy rate is:
   0.791304347826087

NCC accuracy rate is:
     0

NCC accuracy rate is:
   0.007911392405063

Chi-Square accuracy rate is:
   0.080000000000000

sift (1) accuracy rate is:
   0.972515856236786

sift (2) accuracy rate is:
     0

sift (3) accuracy rate is:
   0.809523809523810

sift (4) accuracy rate is:
   0.041666666666667

>>
```

All accuracy rate

Finally, discuss your results: which descriptor performs the best, and for what scenario?

SIFT has the best description performance, and the accuracy rate can reach 97.251% in illumination change scene.

Where did the descriptors fail, and why do you think they fail?

Failure is more likely when the scale of the view is changed or the view is rotated or distorted. If it's just a change in illumination, it's easier to succeed, but if the Angle, the scale, the viewing angle all change then the descriptors don't do as well. I reckon that this is because not only does it change the overall intensity, but the change in the scale of the view also changes the structure of the image. Thus failed.

Problem 2. Improve Feature Matching Accuracy

The code for this result is in "P2.m" file.

What are the accuracy of feature correspondences after employing these two methods?

Compared with the result of P1, P2's method obviously improved the accuracy of feature correspondences.

```
SSD accuracy rate is:
   0.791304347826087

NCC accuracy rate is:
     0

NCC accuracy rate is:
   0.007911392405063

Chi-Square accuracy rate is:
   0.080000000000000
```

The result of P1.

```
SSD accuracy rate is:
   0.830188679245283

NCC accuracy rate is:
     0

NCC accuracy rate is:
   0.017543859649123

Chi-Square accuracy rate is:
   0.111111111111111

fx >>
```

The result of P2.

Problem 3. Efficient Feature Matching

The BRIEF descriptor is a binary feature descriptor that describes a keypoint using a set of binary tests. It is computed by comparing the intensity of a set of pairs of pixels in the neighborhood of the feature. Every comparison produces a bit, and the bit string that results is what makes up the BRIEF description. The main benefit of BRIEF is its quickness. It is suitable for real-time applications because it simply requires straightforward intensity comparisons and can be computed very quickly. In addition, BRIEF descriptors are compact—typically only a few dozen bits—which lowers the amount of memory needed and speeds up feature matching. BRIEF descriptors are excellent for a variety of computer vision tasks because they are resilient to variations in light and rotation.