Summary

The homework is to map two different single images to reconstruct stereo.

1. pts1, pts2 = find_match(img1, img2)

The find_match function matches the SIFT points from the left image to the right image, and returns these good SIFT points. The result is visualized in FIG.1.

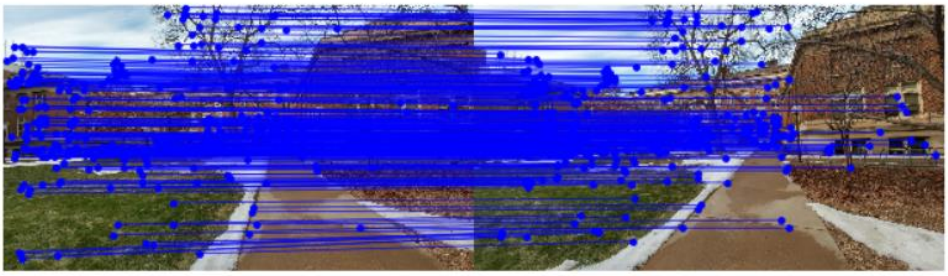

FIG.1 SIFT find match

2. F = compute_F(pts1, pts2)

In this function, the RANSAC iteration time is 10000 and the RANSAC threshold is 0.01, SVD is used to transform F into rank 2, the visualization for the epipolar lines are shown in FIG.2.

FIG.2 Epipolar lines

3. pts3D = triangulation(P1, P2, pts1, pts2)

The triangulation function is to reconstruct 3D points with 2D points on the images.

4. R, C, pts3D = disambiguate_pose(Rs, Cs, pts3Ds)

With the formula r(X-C), the R, C, pts3D with the most correct 3D points are selected from the input, as is shown in FIG.3, the 4th will be selected by this function.

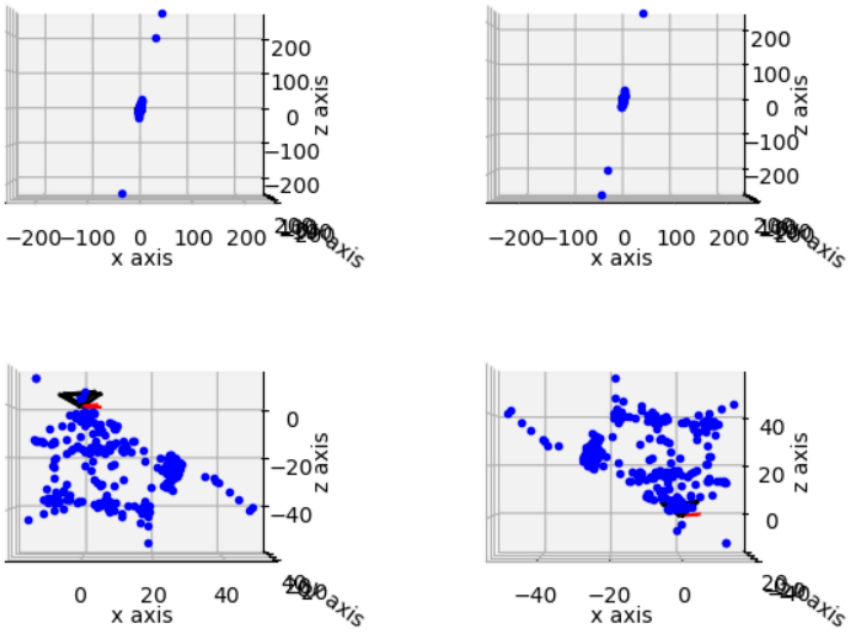

FIG.3 All camera poses

5. H1, H2 = compute_rectification(K, R, C)

H1, H2 can be found directly by the formula:

$$H_{bob} = KR_{rect}K^{-1}$$

$$H_{mike} = KR_{rect}R^{T}K^{-1}$$

The visualization is like in FIG.4.

FIG.4 Rectification

6. disparity = dense_match(img_left_w, img_right_w)

In the function, for all pixels in two pictures, dense sift is calculated by using function cv2.compute, the size of blocks for dense sift calculation is 5, the disparity map is shown below.

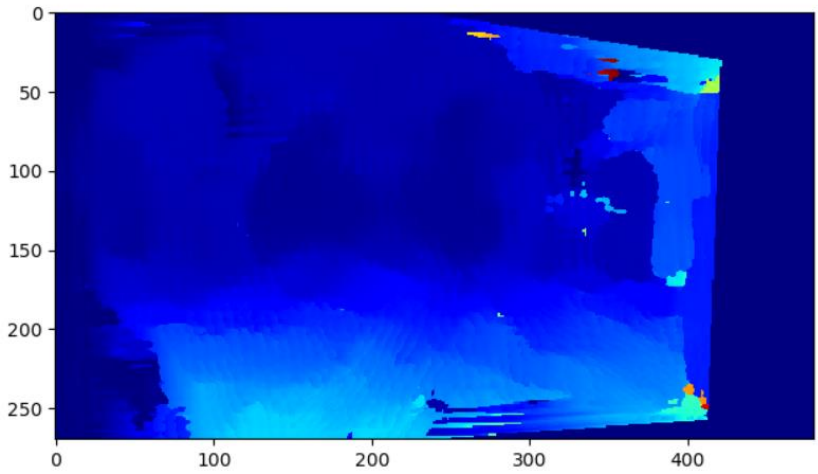

FIG.5 Disparity