

Lab Report 07 - Structure from Motion

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1 1. Feature extraction and initialization with epipolar geometry

For the first part of the exercise the functions `vl shift` and `vl ubcmatch` were used to extract features and match them. The matching can be seen in the picture below:

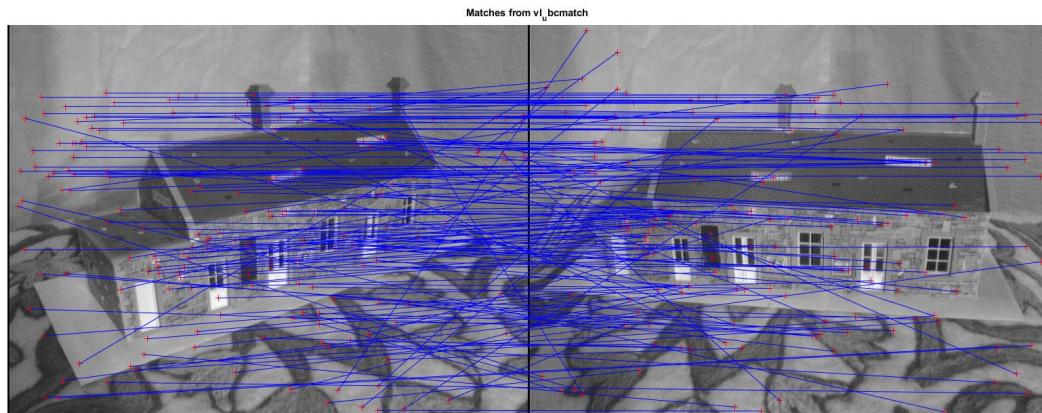


Figure 1: matched features from `vl ubcmatch`

As can be seen the set contains many correct matches but still a significant

number of false positives. To improve this an 8-Point RANSAC Algorithm was used to compute a set of inliers.

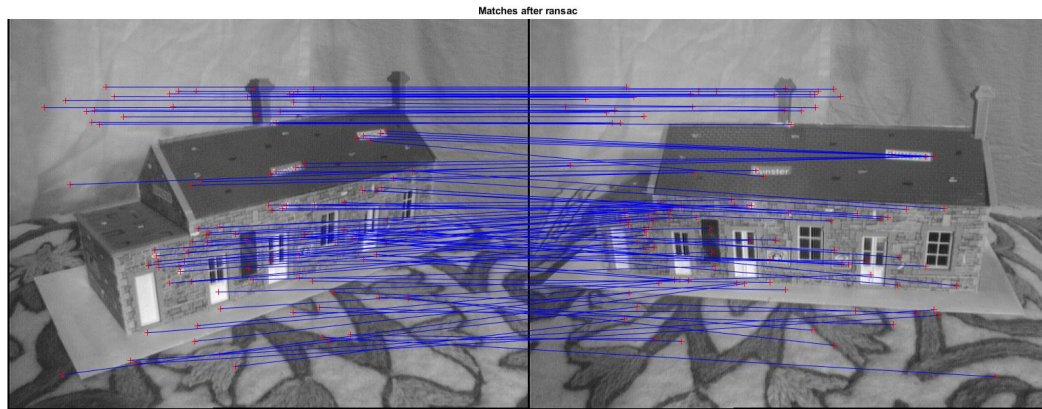


Figure 2: Inlier matches after using 8-point RANSAC

From these inliers the Fundamental Matrix F was computed which was then used, together with the intrinsic camera parameters K to calculate the Projection Matrix P . The projection Matrix P and the calibrated corresponding points of the two images was then used in the provided *linearTriangulation* function to compute the 3D Points.

Last for this exercise the epipolar geometry of the corresponding images 0 and 4 are shown. As can be seen in the image the epipoles don't lie within the images.

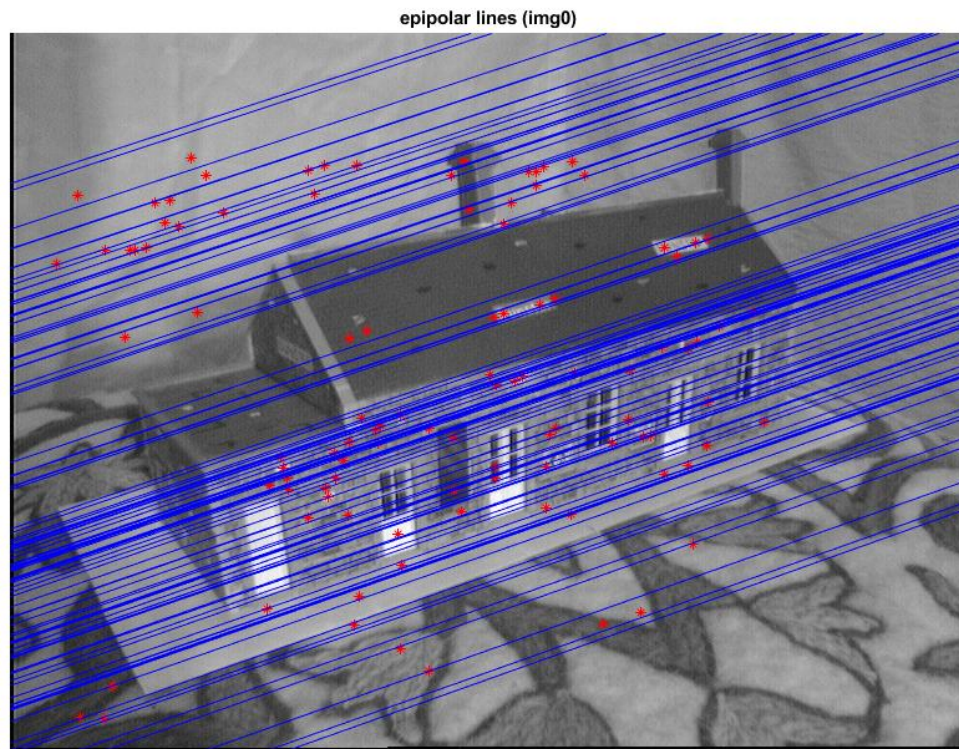


Figure 3: Epipolar Lines in image 0

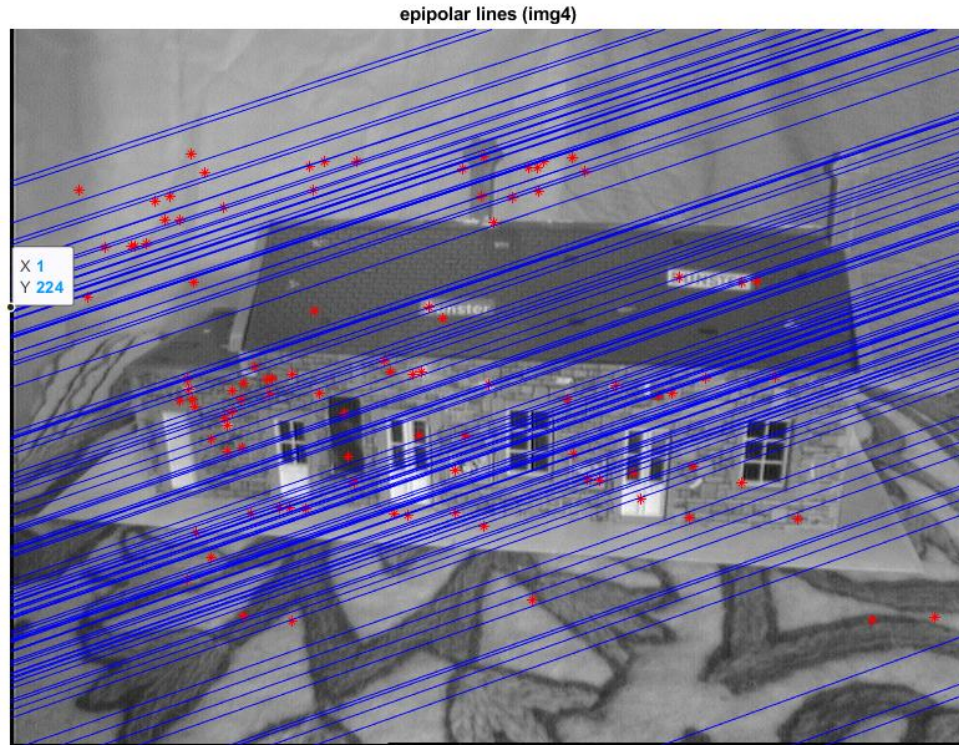


Figure 4: Epipolar Lines in image 4

2 Additional Views

As described in the Exercise two additional views were implemented. Hereby, *vlubcmatch* is calculated using the inlier descriptors obtained in task 1 from image one and the descriptors from the new additional image. This insures that only points already present in the two most extreme views can be matched. Then the process is similar to the above with the exeption of a 6-point Ransac algorithm beeing used.

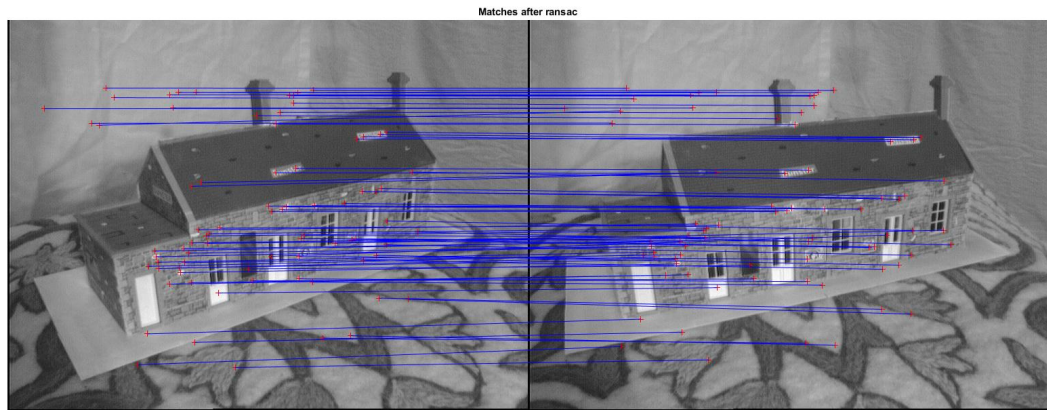


Figure 5: Inlier matches between image 0 and 1 after using 6-point RANSAC

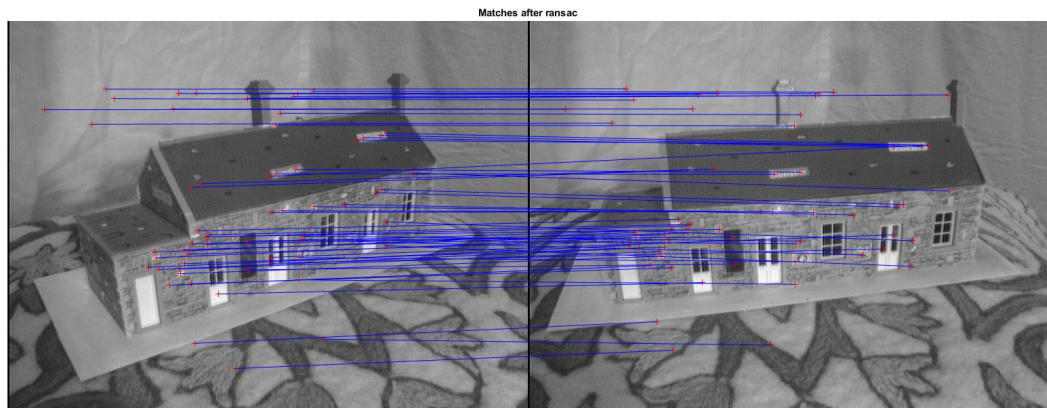


Figure 6: Inlier matches between image 0 and 2 after using 6-point RANSAC

3 3D Plotting

To plot all the points projected into 3D space the function `plot3` was used with the 3 corresponding coordinates of the points.

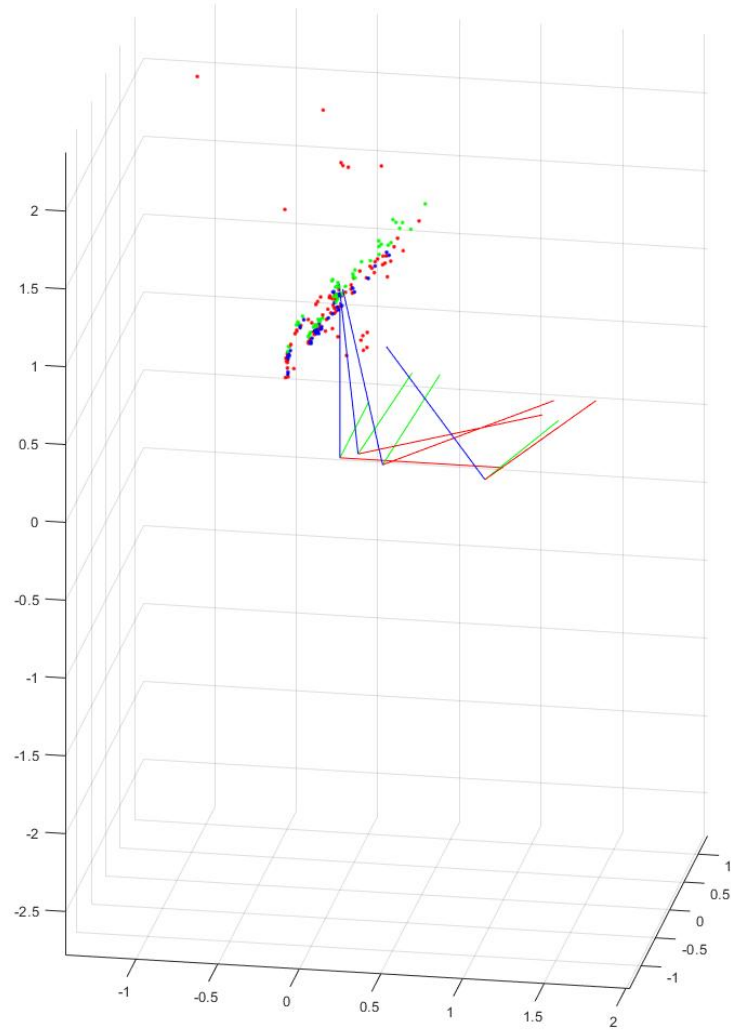


Figure 7: 3D view of the camera positions (img 0,1,2,4) and the reprojected 3D points for the three named image pairs

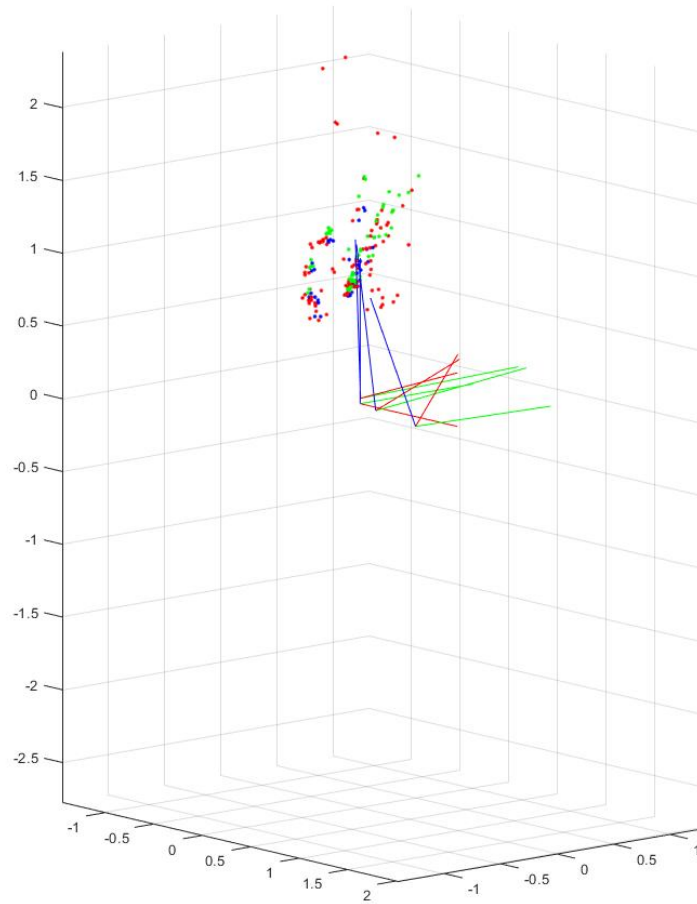


Figure 8: 3D view of the camera positions (img 0,1,2,4) and the reprojected 3D points for the three named image pairs

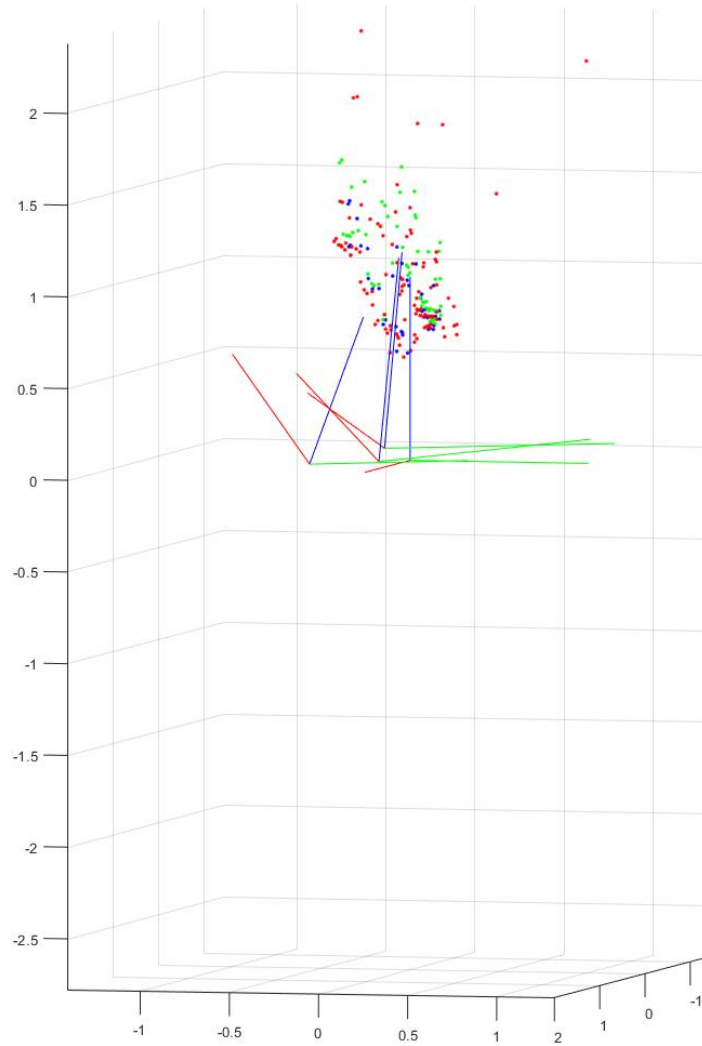


Figure 9: 3D view of the camera positions (img 0,1,2,4) and the reprojected 3D points for the three named image pairs