

7.1 Feature extraction and initialisation with epipolar geometry

- Feature extraction and matching

Feature extraction and matching is done with the `vl_sift()` and `vl_ubcmatch()` functions from the `vlfeat` toolbox.

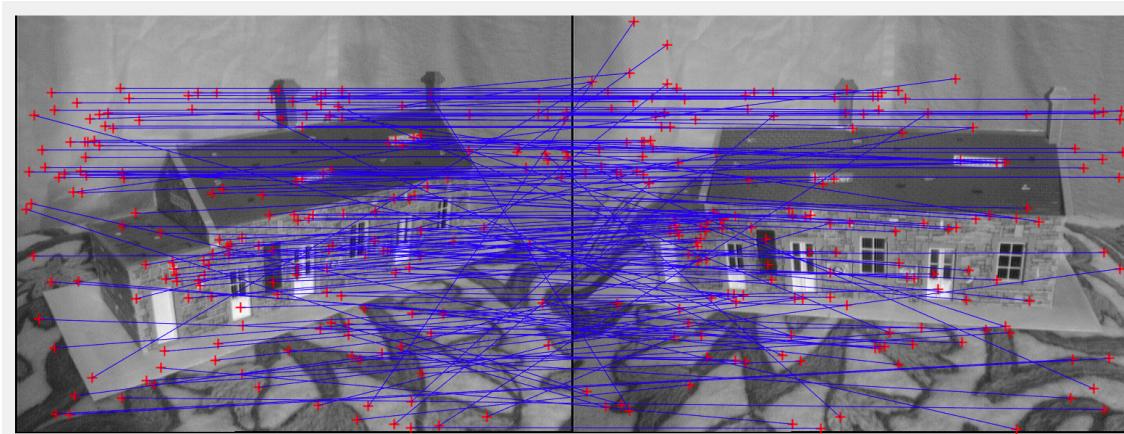


Figure 1: Feature matches for initialization

- 8-point RANSAC algorithm

This is done with the `ransacfitfundmatrix()` function provided. This function is used to compute the fundamental matrix F and the inliers.

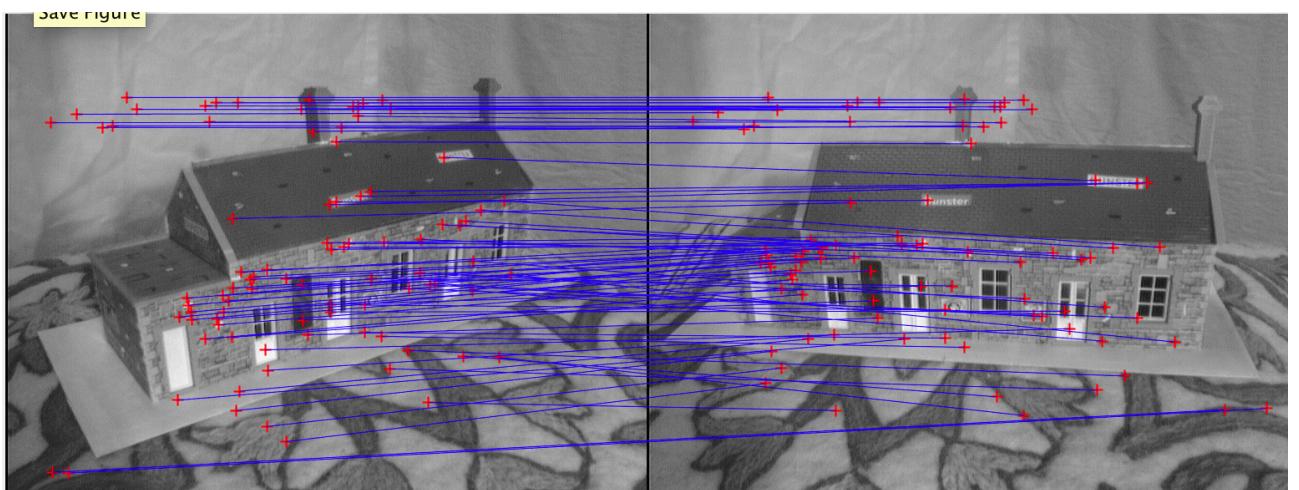


Figure 2.1: Feature matches for inliers, derived with 8-point RANSAC algorithm

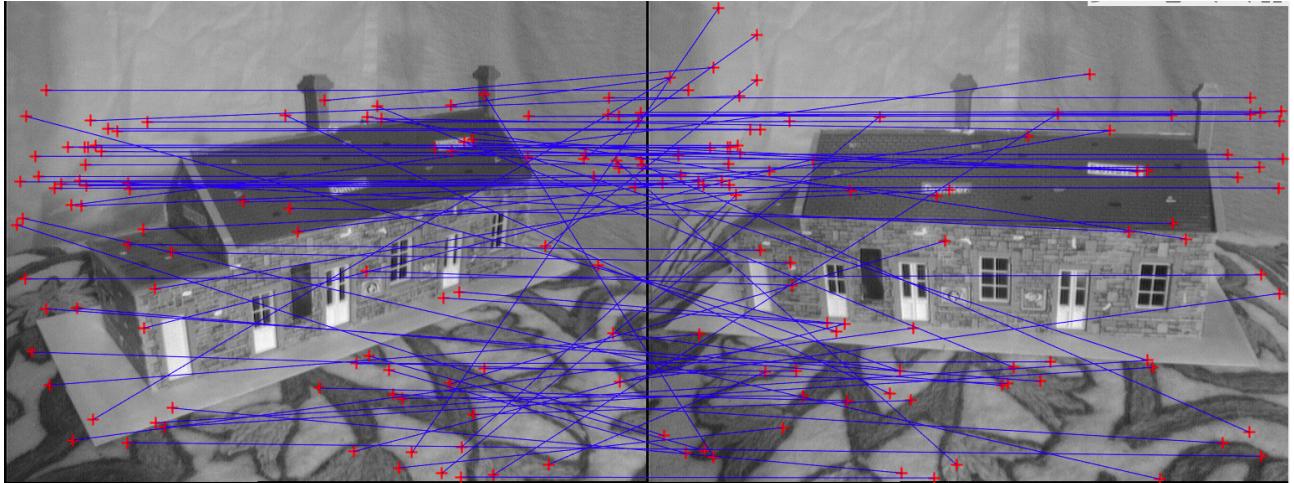


Figure 2.2: Feature matches for outliers, derived with 8-point RANSAC algorithm

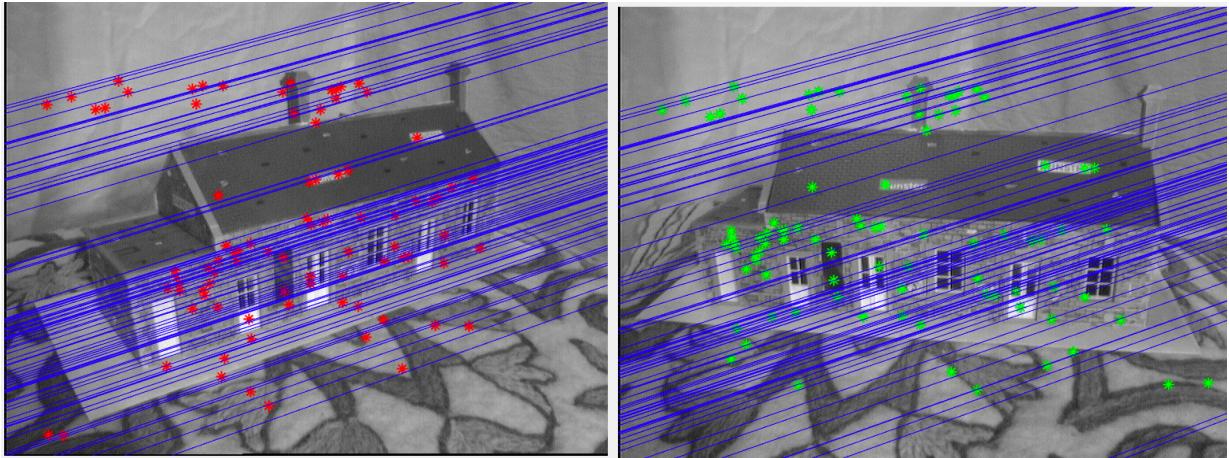


Figure 3: epipolar lines for image 1 and 4

The Essential matrix is computed as $E = K' * F * K$. The projection matrix of the first view is set as an identity matrix. The projection matrix of second view is obtained by decomposing E using `decomposeE()` function.

- Triangulation

Triangulation is done by `linearTriangulation()` function, with the two projection matrices and the calibrated inlier points as the input.

7.2 Triangulation and add new views

We iteratively take in new views, do feature extraction and match with image0. Then, we compute the inliers by `ransacfitprojmatrix()` function, which fits projection matrix using RANSAC algorithm. Then, we calibrate the points and triangulate them.

This gives us the following results.

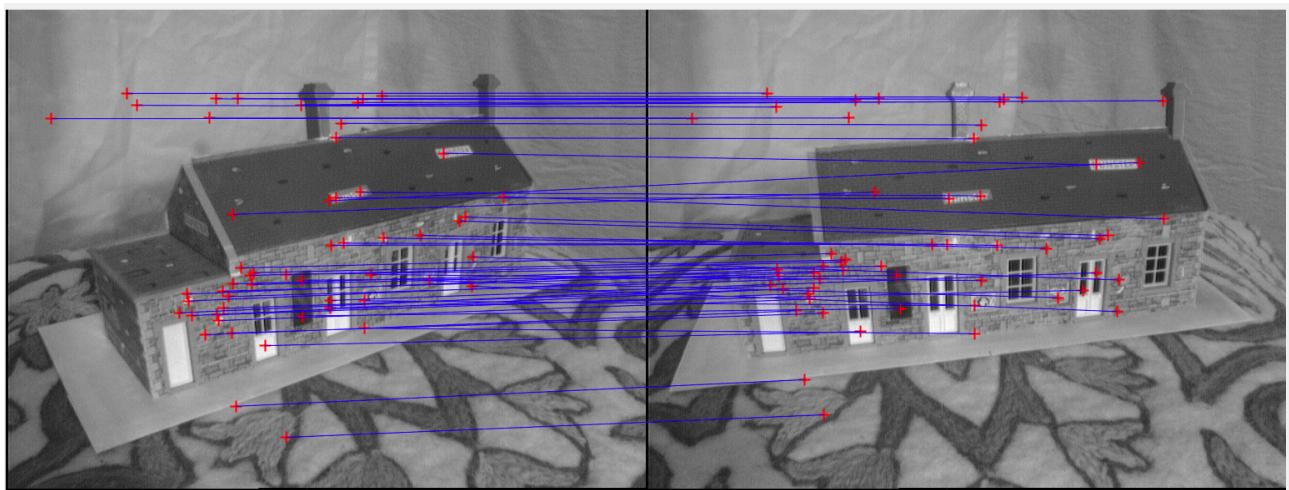


Figure 4: Feature matches for inliers, for image 0 and 2

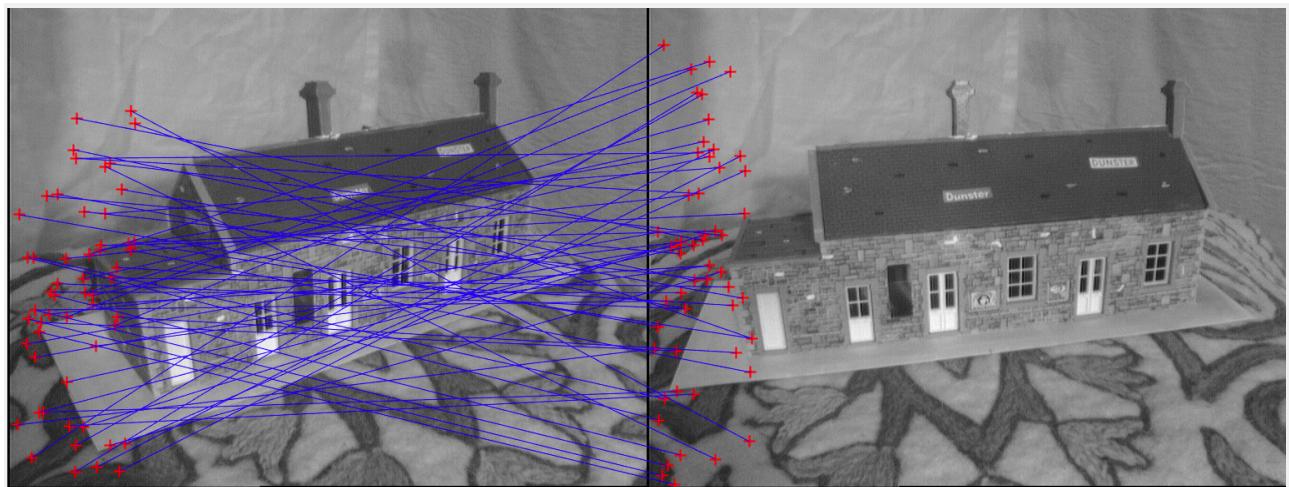


Figure 5: Feature matches for outliers, for image 0 and 2

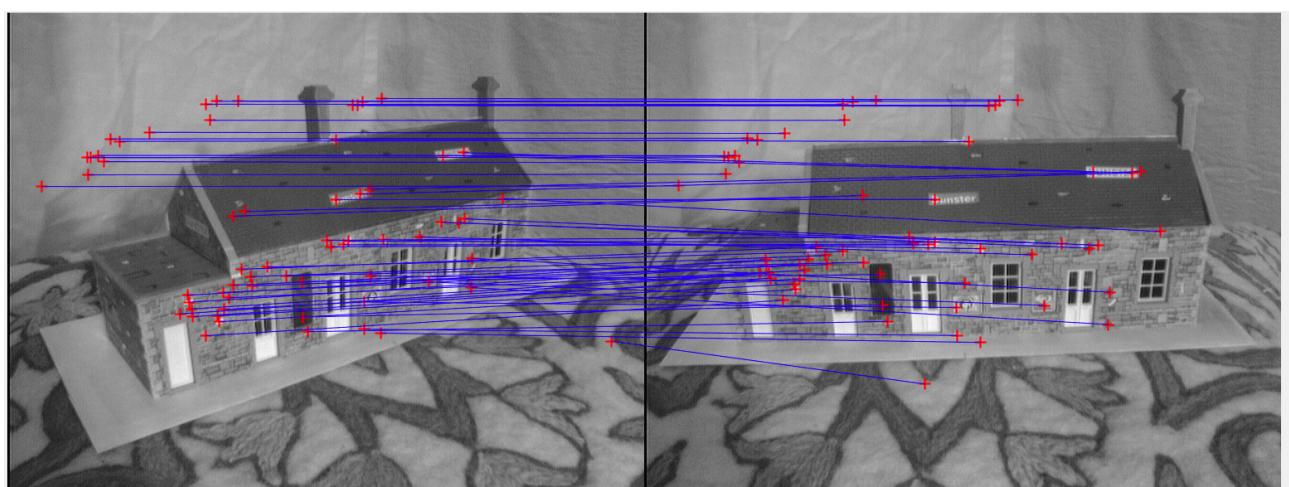


Figure 6: Feature matches for inliers, for image 0 and 3

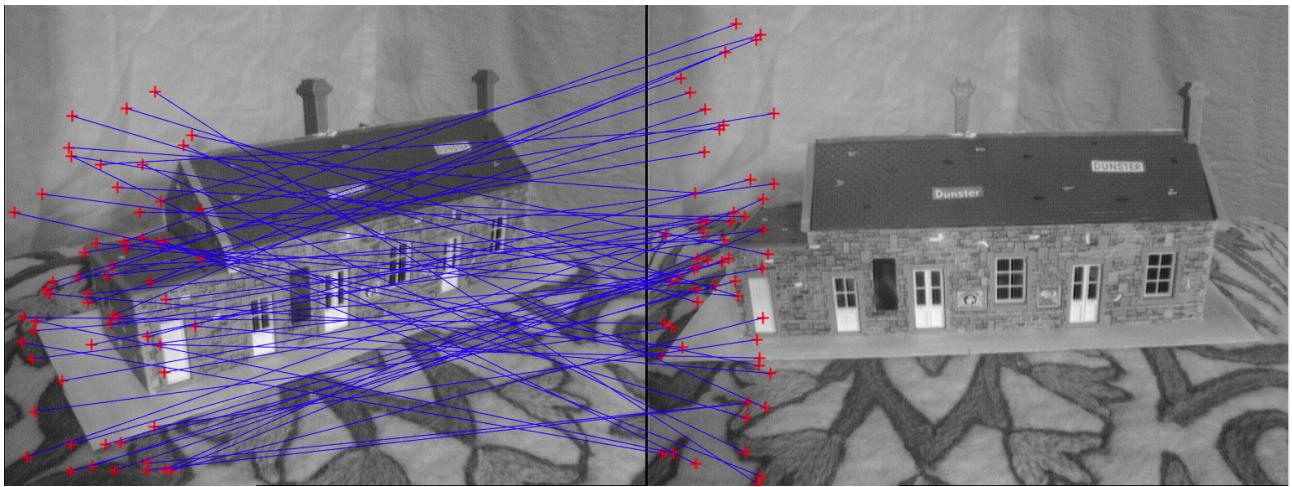


Figure 7: Feature matches for outliers, for image 0 and 3

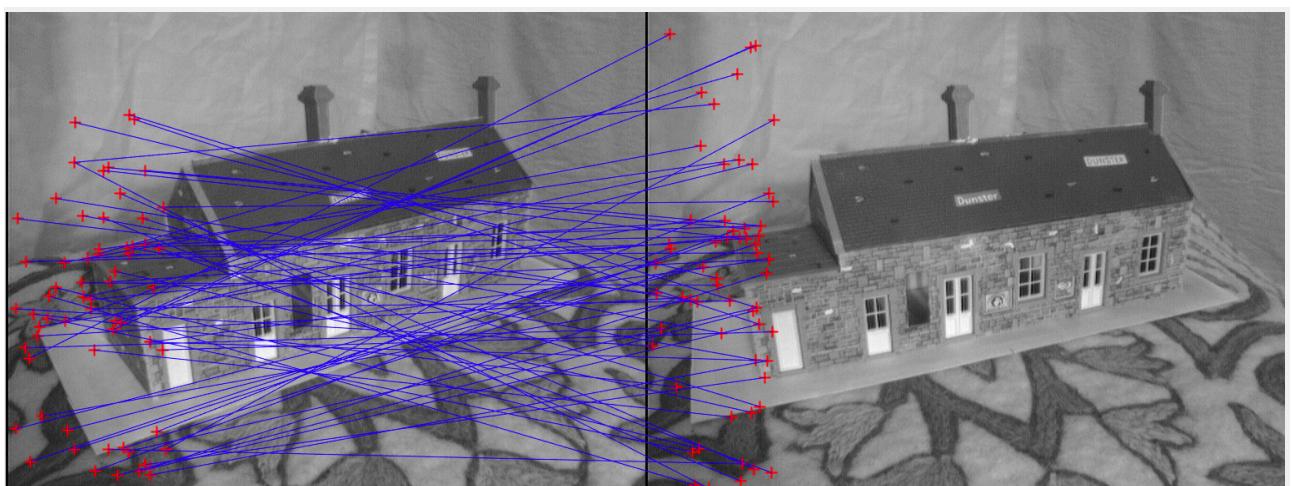
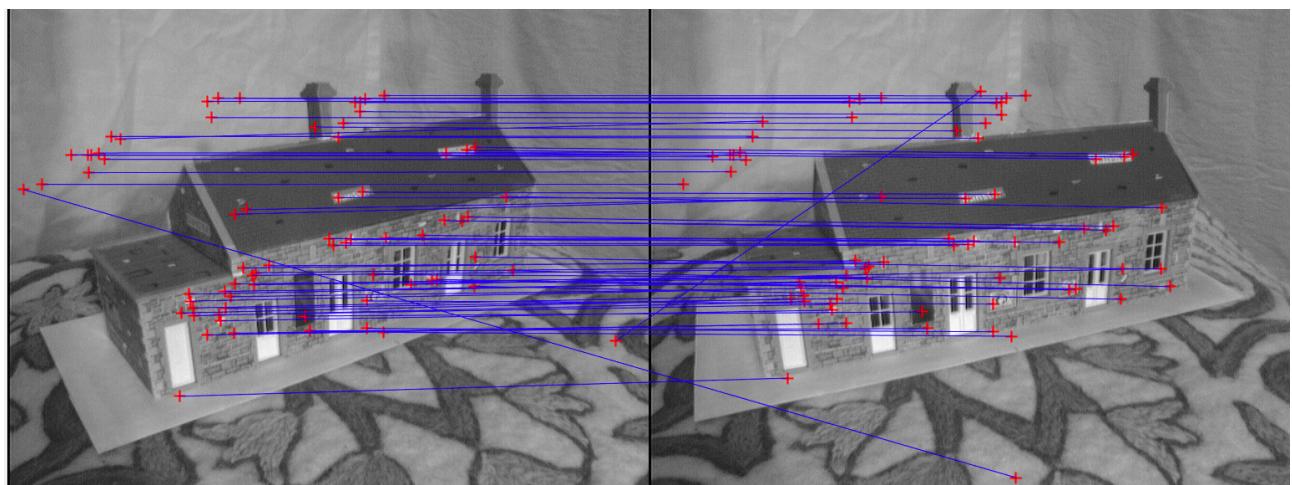


Figure 9: Feature matches for outliers, for image 0 and 1

- Plotting

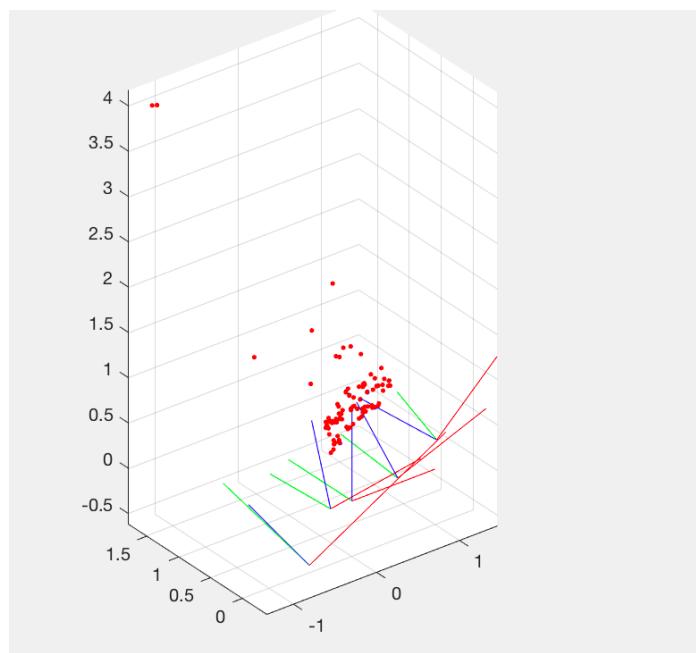


Figure 10: Plot the triangulation of inlier matches in 3D and camera poses