

# Model Fitting

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## 1 Line fitting

As shown in the Fig. 1. Solution from ransac is very close to the real one, while least square solution is the worst because of outliers. We report the error as the Table 1

## 2 Fundamental matrix estimation

We manually picked points and plot the figures as shown in Fig. 2 3 and 4. We picked more than eight points in all pictures.

### 2.1 Computing fundamental matrix

We used eight algorithms and compute the fundamental matrix for both with singularity constraint and without singularity constraint. The difference is very small.

- pumpkin:  $F \approx F_h = \begin{bmatrix} 0.0000 & -0.0000 & -0.0010 \\ 0.0000 & -0.0000 & 0.0041 \\ 0.0006 & -0.0036 & 0.0288 \end{bmatrix}$
- ladybug:  $F \approx F_h = \begin{bmatrix} 0.0000 & 0.0001 & -0.0337 \\ -0.0001 & -0.0000 & 0.0386 \\ 0.0273 & -0.0363 & 1.2559 \end{bmatrix}$
- rect:  $F \approx F_h = \begin{bmatrix} 0.0000 & -0.0000 & -0.0003 \\ -0.0000 & 0.0000 & 0.0001 \\ -0.0003 & 0.0029 & 0.4848 \end{bmatrix}$

### 2.2 Comparison between $F$ and $F_h$

In this section we compare two matrices  $F$  and  $F_h$  for all images. See Fig. 5 to 10

We can see a slight difference when we use non singular constraint  $F$ , lines are not always intersect at one point, for example in the figure of Ladybug. And if we add this singularity constraint, lines are always intersecting with some compromise in going through all points.

## 3 Feature extraction and matching

We installed the toolbox as required and have the Fig. 11 to 13.

Method	Measured error
Real	31.0906
RANSAC	31.4519
LS	153.3238

Table 1: Error

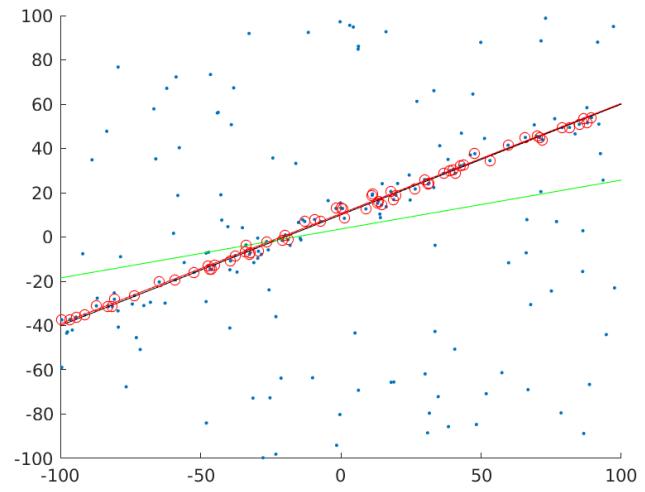


Figure 1: Comparison between real, ransac and ls solutions

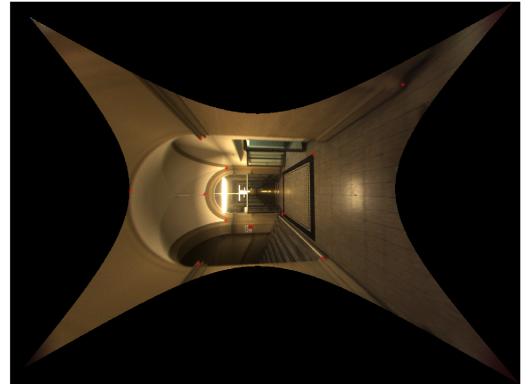
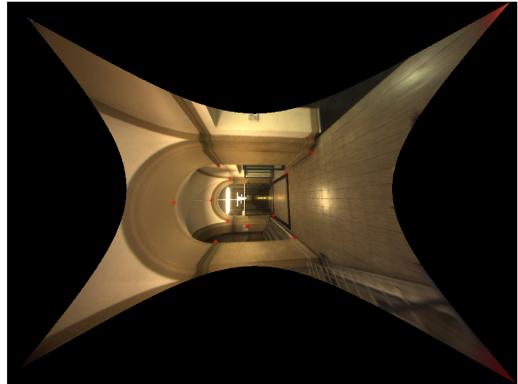


Figure 2: Ladybug with points

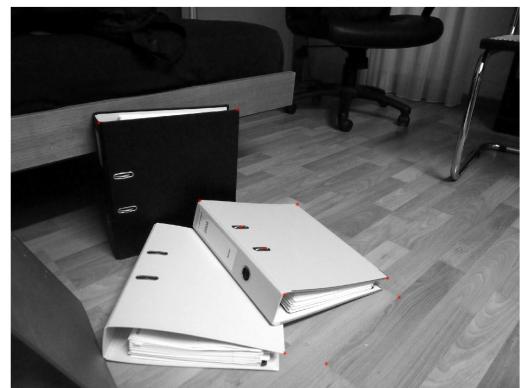
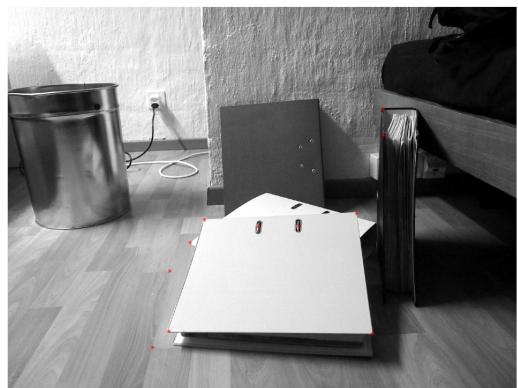


Figure 3: Rect with points

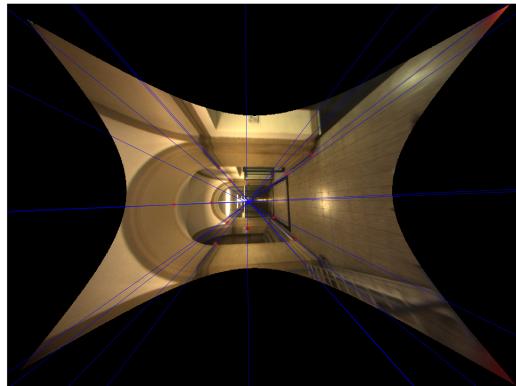


(a) pumpkin1

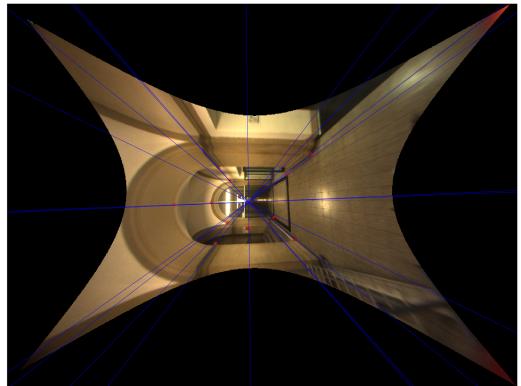


(b) pumpkin2

Figure 4: Pumpkin with points

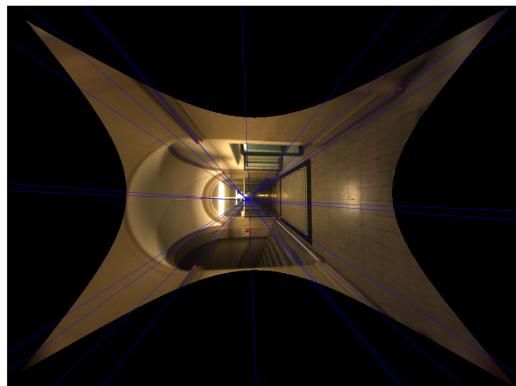


(a) F

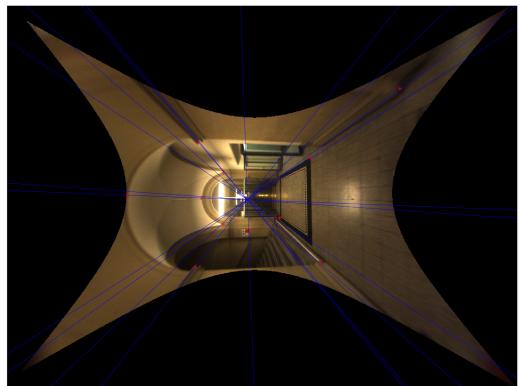


(b) Fh

Figure 5: Ladybug1

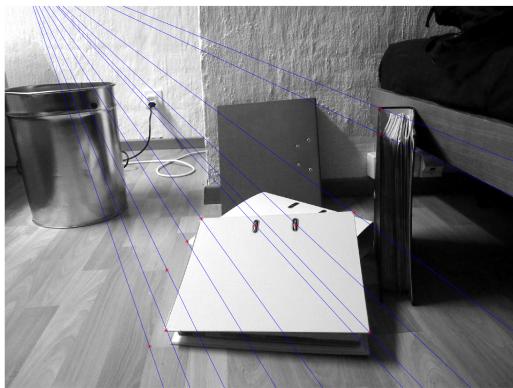


(a) F

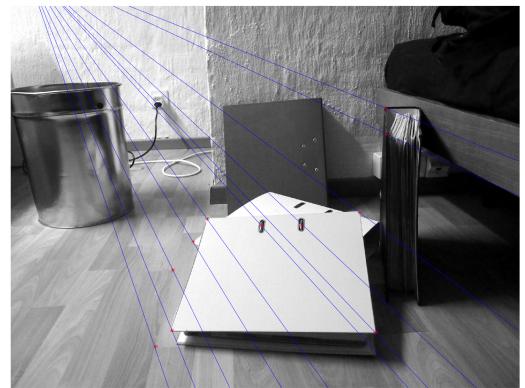


(b) Fh

Figure 6: Ladybug2

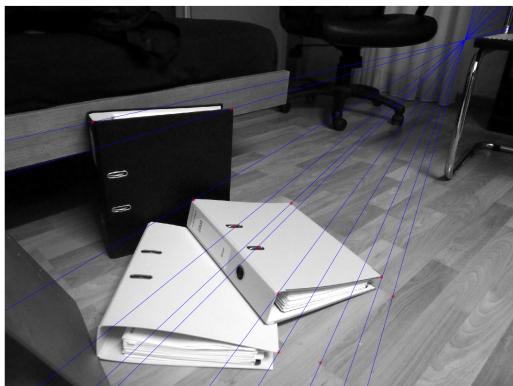


(a) F

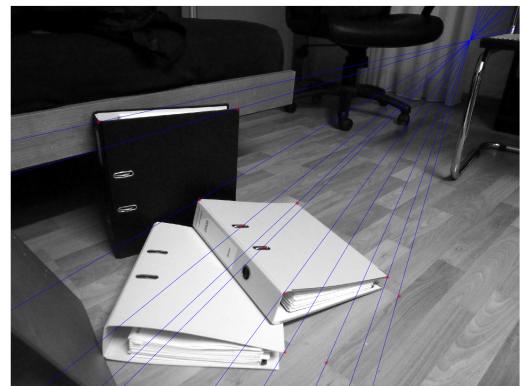


(b) Fh

Figure 7: Rect1



(a) F



(b) Fh

Figure 8: Rect2



(a) F



(b) Fh

Figure 9: Pumpkin1



(a) F

(b) Fh

Figure 10: Pumpkin2

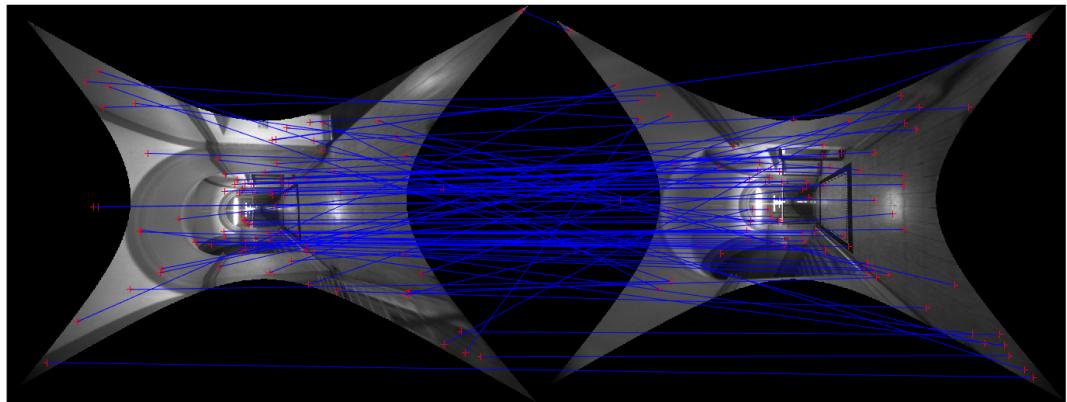


Figure 11: Ladybug: vl match



Figure 12: Rect: vl match

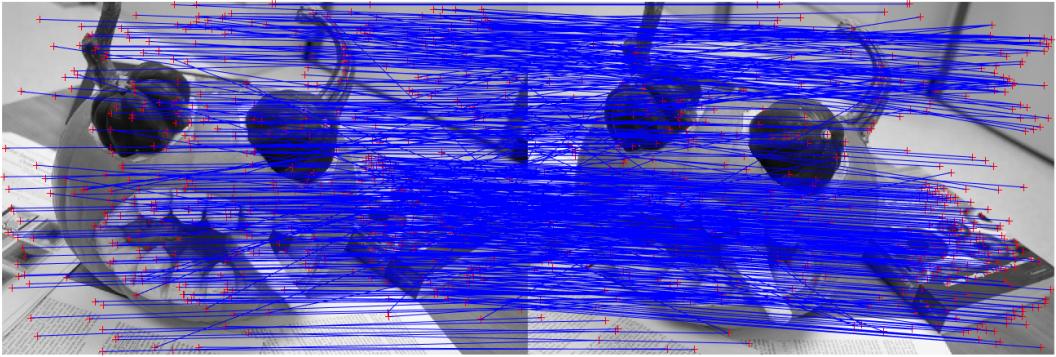


Figure 13: Pumpkin: vl match



Figure 14: Rect: threshold 2, inliers count 26, mean inlier error 1.06

## 4 Eight point RANSAC

### 4.1 Simple RANSAC

We vary the threshold between 5 and 2. See Fig. 14 to 19.

### 4.2 Adaptive RANSAC

We choose threshold 5 in this section, probability significance 0.99. See the Fig. 20 to 22.



Figure 15: Rect: threshold 5, inliers count 56, mean inlier error 2.19

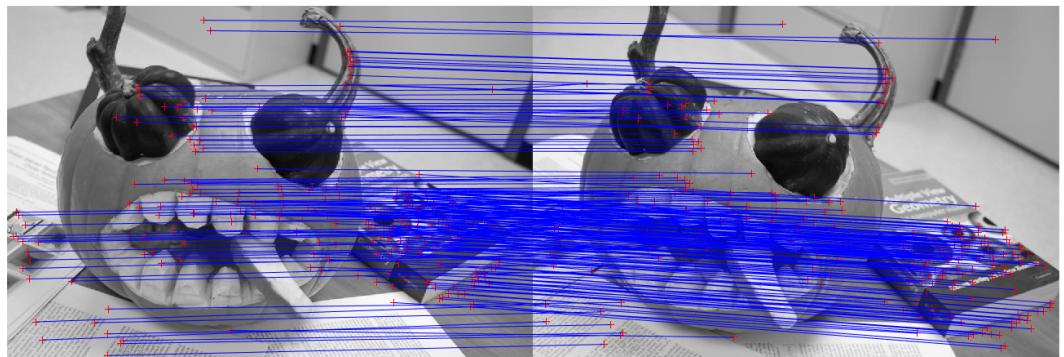


Figure 16: Pumpkin: threshold 2, inliers count 256, mean inlier error 0.80

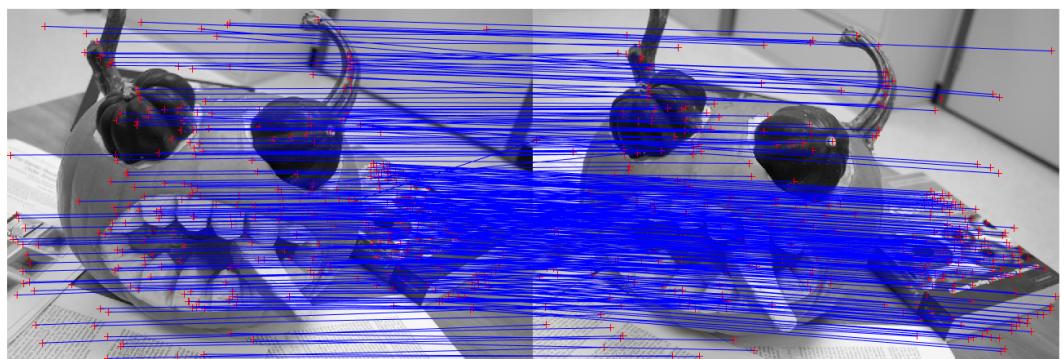


Figure 17: Pumpkin: threshold 5, inliers count 411, mean inlier error 1.54

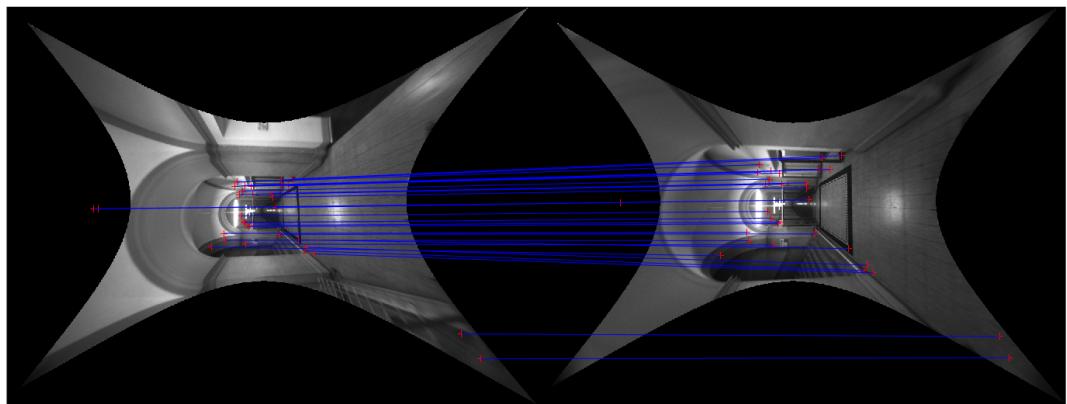


Figure 18: Ladybug: threshold 2, inliers count 37, mean inlier error 1.06

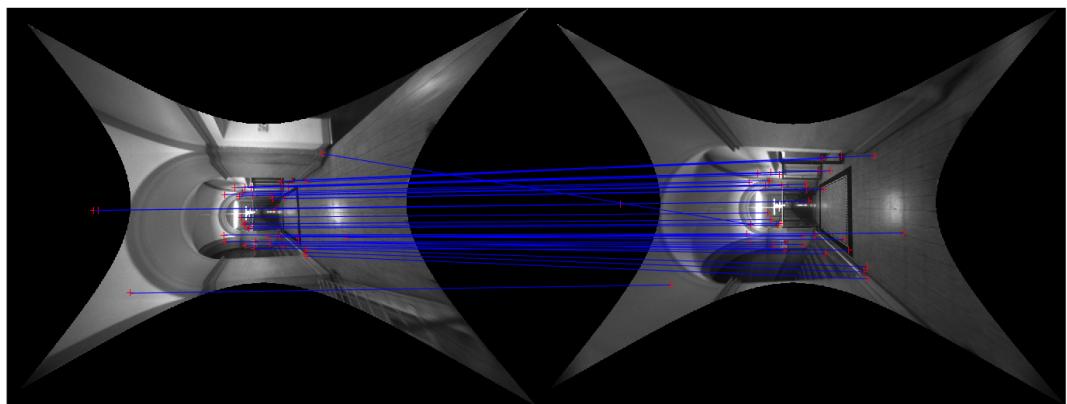


Figure 19: Ladybug: threshold 5, inliers count 46, mean inlier error 1.78



Figure 20: Trial = 169221

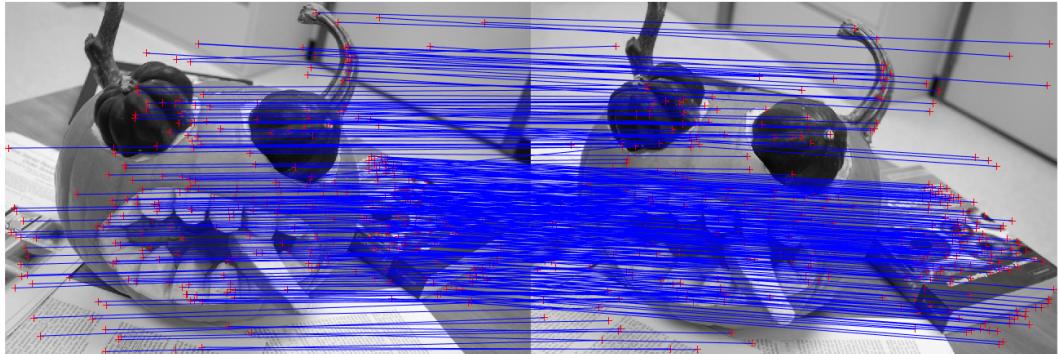


Figure 21: Trial = 442

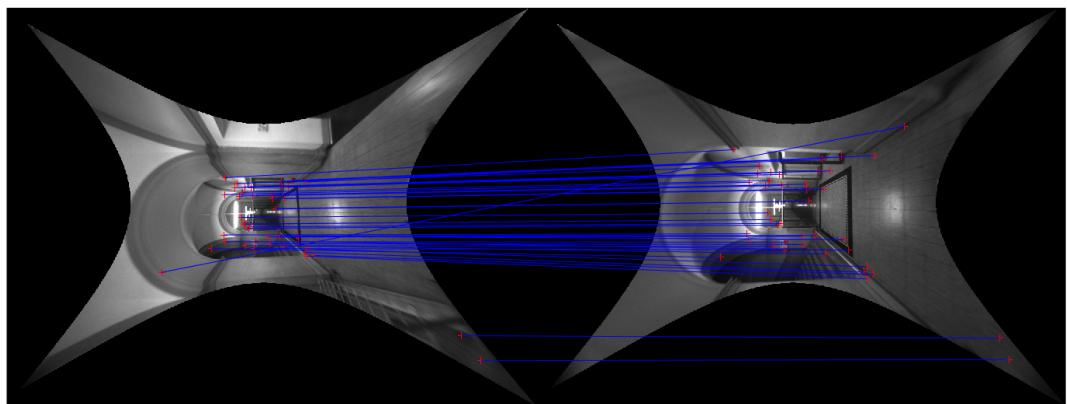


Figure 22: Trial = 1499