Fundamental matrice, its calculation, RANSAC algorithm

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Abstract. Given two images (I1 and I2) of a static scene acquired from different viewpoints. The goal of Practical work is to estimate the fundamental matrix F using RASNAC algorithm and than calculate the epipolar lines.

1. Methodology

The SIFT generate around 1400 features for each image, and resulted in 675 point correspondences. We RANSAC algorithm to find the inliers. The RANSAC can be summrized as follows:
For each iteration:

- We randomly select 8 point matches to compute a candidate F matrix using the 8-point algorithm.
- We then classify inliers by using the distance function seen in the course (slide 22) using the current candidate F.
- If the current candidate F has more inliers than the best F found so far, we update the best F and keep track of the inliers.
- The number of iterations is adjusted dynamically based on the inlier ratio seen in the course (slide 23) to make the algorithm more efficient.

After the estimation of F, we compute the epipolar lines. For a clicked image point p in homogeneous coordinates, the corresponding epipolar line l is computed as: $l = F * p$ if p is in I1 $l = F^T * p$ if p is in I2. The epipolar line is drawn on the respective image using two points on the image boundaries.

Please refer to the code for more details.

2. Results

Figure 1. SIFT detects around 1400 features for each image and 675 matches

Figure 2. Based on the computed matrix F there are a total of 559 inliers.

Figure 3. Yellow epipolar lines corresponds to points from left image.Red epipolar lines corresponds to points from right image

Figure 4. Another example of of epipolar lines.Yellow epipolar lines corresponds to points from left image.Red epipolar lines corresponds to points from right image