VISION: Fundamental

Lucrezia Tosato

1 Section 1 : Goal

Fundamental matrix computation with RANSAC algorithm.

- To determine the fundamental matrix from two images of the same scene without prior knowledge of the internal parameters of the camera
- Determine the *SIFT inliers*
- To draw the epipolar line associated with a point selected by the user in the other image

2 Section 2 : Commands for compile

For compile the code in Linux is necessary to enter through the terminal the right folder where cthe code".cpp" and the images and write:

```
cmake .
make
./Fundamental
```

A single C++ file, named *Fundamental.cpp* loads and displays both images, which can be passed as parameters to the program named *Fundamental*. An algorithm determining the SIFTs is then run on each image, and the matches between SIFTs are recorded.

These matches are then cleaned up by RANSAC, by calculating a fundamental matrix with the 8-point algorithm, and by discriminating the matches determined by SIFT matching by calculating the distance of a point of a match to its associated epipolar line. If this distance is less than 10^{-5}, then the match is considered as *inlier*. This distance criterion was used to obtain 8 matches uncontaminated by outliers by random draw, in about twenty-thirty iterations, keeping only a number of matches that vary between 499 and 565 (since the value is randomly chosen, the result varies each time the algorithm is ruined) out of the 675 returned by SIFT matching.

The basic concept is that since a certain accuracy is reached in the function "computeF",it'll keep calling other functions that will keep circulating F, at the end we only keep the one with the higher number of matches.

3 Section 3 : Results

Figure 1: Alg. SIFT working

Figure 2: Visualzation of Matches

Figure 3: First Point First Epipolar

Figure 4: Second Point Second Epipolar

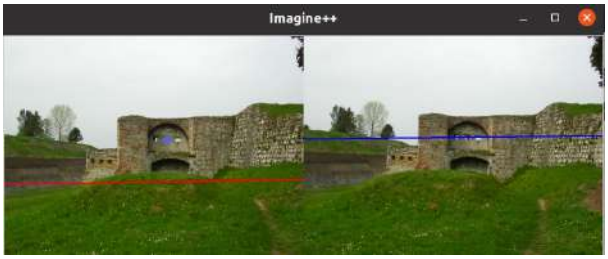


Figure 5: Third Point Third Epipolar

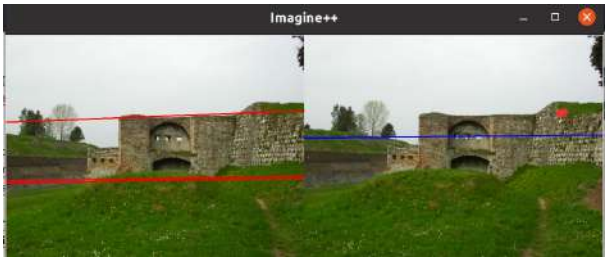
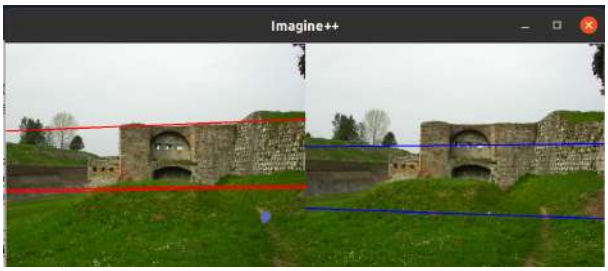


Figure 6: Fourth Point Fourth Epipolar



The code is working properly, we expect to clicks in one image and see corresponding line in other image, that is what is happening.
At right mouse click the code stop working, and after another clock the windows close.