Lab_6

Michele Moriconi (S4861803), Giovanni Rocca (S4802954)

November 2022

1 Introduction

The goal of the lab is to understand and implement the 8 points algorithm, to estimate the fundamental matrix F. To achieve this goal we use two different versions of the algorithm, one with normalization and the other without. Finally we check if F is correct by plotting the epipolar lines on the original image.

2 Materials/Methods

The laboratory is carried out on MatLab. The core of the program is the main function, where the images are uploaded and functions are called. Three different functions are used in the program:

- EightPointsAlgorithm: this function implements the steps of the eight points algorithm.
- normalise2dpts: this function is used to normalize the points.
- EightPointsAlgorithmN: this function implements the steps of the eight points algorithm using the normalized points.
- dochecks: we use this function to check if the results we have obtained are correct (for example using the function "visualizeEpipolarLines").
- visualizeEpipolarLines: this function plots the epipolar lines on the original image.

3 Results

The first thing we do is to load the images and extract the points given belonging to the images.

The four images we must load are pairs of two different scenes looked at from different points of view.

Using the sets of points we can compute the matrix A. Once we know the A matrix we apply the SVD decomposition to it, then selecting as solution the

last column of V we can obtain the fundamental matrix F by using the MatLab function "reshape".

In the EightPointsAlgorithm the last step is to force the rank of F to be 2, using once again the SVD decomposition, setting D(3,3) = 0 and finally recomputing F with the following formula: F = U * D * V^T

There is one more step implemented only in the EightPointsAlgorithmN that consists of de-normalizing the resulting F as T_2^T * F * T_1.

4 Conclusions

Using the dochecks function we plot the epipolar lines and the sets of points. Plotting the points and the epipolar lines simultaneously is easy to check if the epipolar lines generated from the points on the first image pass through the points on the second one and viceversa. It is immediate to notice that the results from the normalized version of the algorithm are more precise than the other ones.

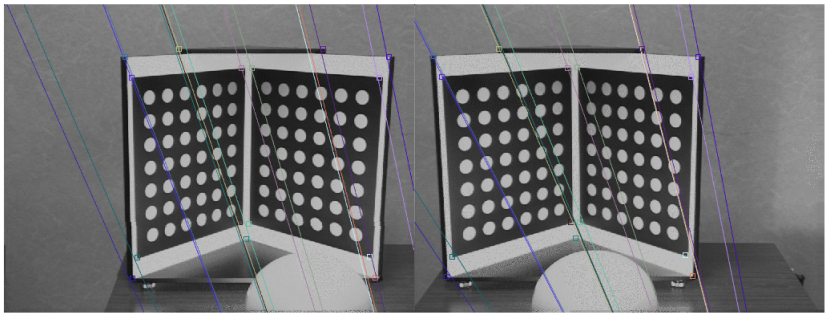

Figure 1: Mire epipolar lines

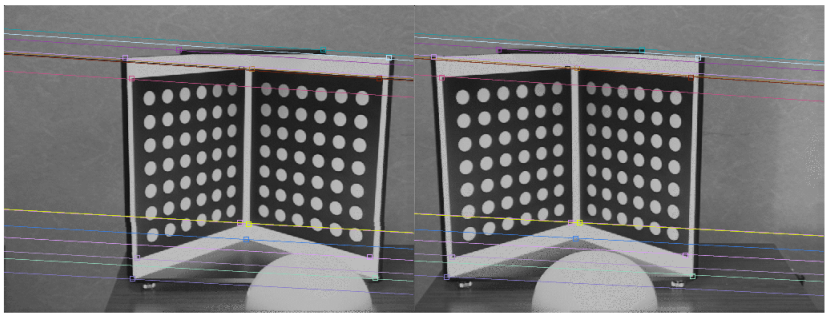

Figure 2: Normalized Mire epipolar lines

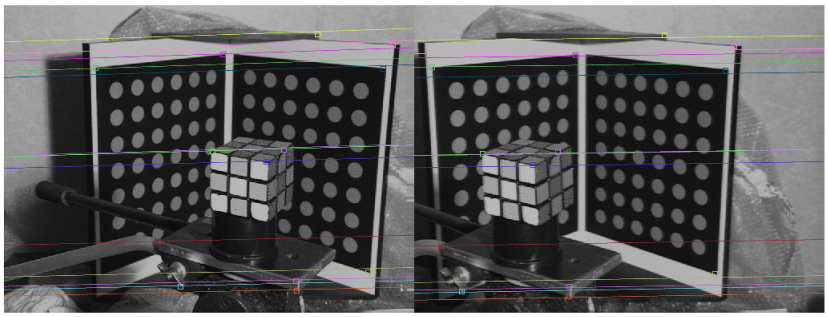

Figure 3: Rubik epipolar lines

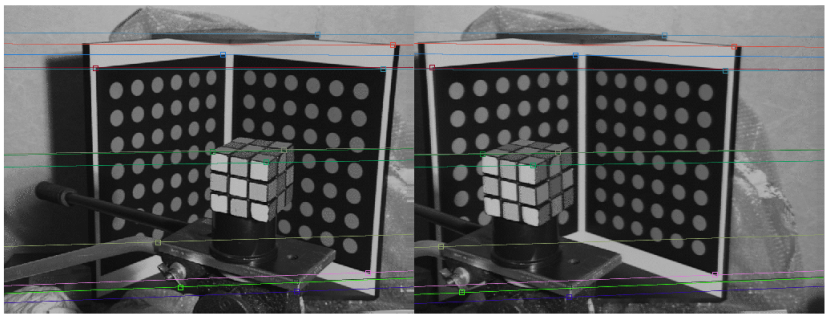

Figure 4: Normalized Rubik epipolar lines