Epipolar Geometry
Lab Session 3
Computer Vision Lab Report (2019-2020)

MLDM 2019-2021

JEAN MONNET UNIVERSITY

SAINT-ETIENNE

Rohith Teja Mittakola
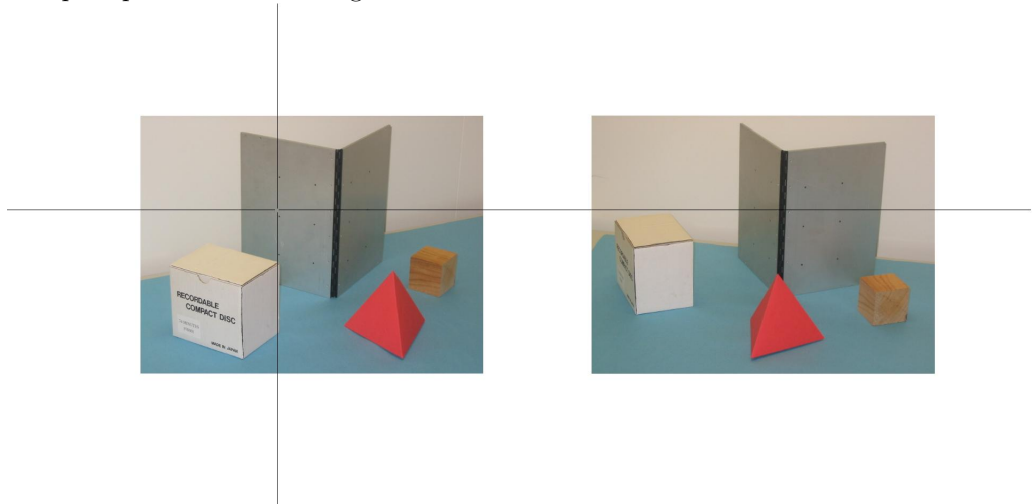
Yogesh Kumar Pilli

February 2020

1 Objective

To study the Epipolar geometry and to implement the knowledge acquired on the stereo vision.
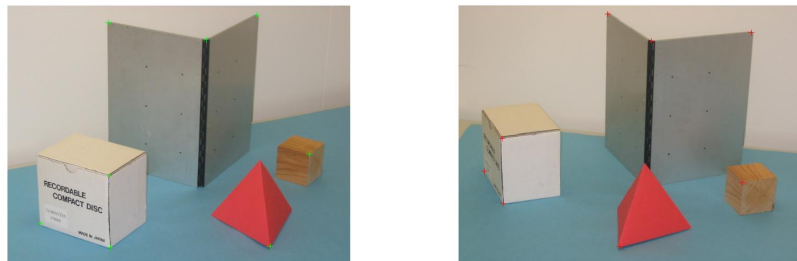
2 Epipolar Geometry

2.1 Click Points

1. The clickpoints function lets the user to select 8 different sets of points in left and right stereo images namely, X1 and X2.

2. The prompt to select the images is shown as -

3. The user has to choose 8 pairs of points in both images -

2.2   Matrix A

1. There is a MatF function which generates the Fundamental matrix, which maps the chosen points to the corresponding epipolar line.

2. The calculation of Fundamental matrix is done using the 8 Point algorithm.

3. Then the left and right epipoles are calculated using the Fundamental matrix.(null function in matlab is used for this purpose, which returns the orthonormal basis for the null space of F.

2.3   Click function

1. The click function used in the experiment calculates the equation of epipolar line using the fundamental matrix and the input point in the left image.

2. The Y coordinate is then calculated by comparing the epipolar line equation to the standard line equation $ax + by + c = 0$.

3. This Y coordinate is used to plot the corresponding epipolar line on the right image based on the input point point in left image.

2.4   Results

1. The epipolar lines are calculated and projected for 3 sample points as show below. This is done by running the clickpoints function and selecting 8 pairs of points -
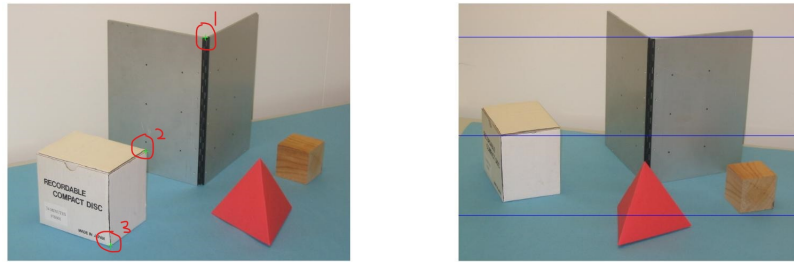
2. The points saved in the file "betterPointsX1X2.mat" are used to calculate the epipolar lines -
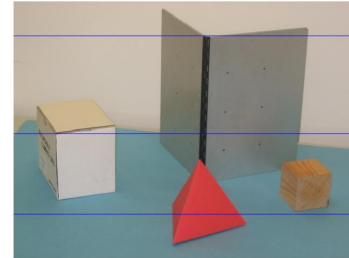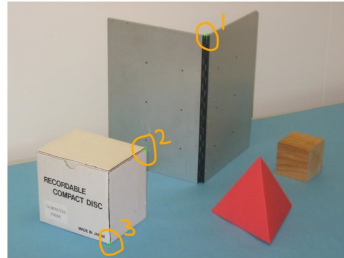
3. As seen in the above two images, the output is similar to the corresponding input points.

4. The closeness of the epipolar lines in two images is highly dependent on the accuracy of user input in selecting the 8 pairs of points initially.

5. The fundamental matrix is calculated -

F		
3x3 double		
	1	2	3
1	-4.6491e-07	-8.3935e-06	-0.0010
2	-2.6518e-06	-3.6516e-06	0.0281
3	-0.0015	-0.0218	0.9994

6. The left epipole is -

leftEpipole		
3x1 double		
	1	2	3
1	-0.9988		
2	-0.0496		
3	3.9292e-04		

7. The right epipole is -

rightEpipole		
3x1 double		
	1	2	3
1	0.9979		
2	-0.0655		
3	8.5759e-05		