CS 537: Assignment 3:

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1 Five F_0 for image pairs

The matrices are as follows:

1) **Image pair 1:**

$$F_{2_1} = \begin{bmatrix} -5.5683e-07 & 2.5569e-06 & -0.0008 \\ 1.4834e-06 & 9.8877e-07 & -0.0017 \\ -0.0008 & -0.0013 & 1.0000 \end{bmatrix}$$

2) **Image pair 2:**

$$F_{2_2} = \begin{bmatrix} -9.9208e-07 & 2.8939e-06 & 4.6670e-05 \\ -4.4600e-06 & -8.5360e-06 & 0.0043 \\ 0.0009 & 0.0021 & -1.0000 \end{bmatrix}$$

3) **Image pair 3:**

$$F_{2_3} = \begin{bmatrix} 5.7693e-06 & 6.2417e-06 & -0.0028 \\ 6.3746e-06 & 7.8708e-06 & -0.0033 \\ -0.0020 & -0.0024 & 1.0000 \end{bmatrix}$$

4) **Image pair 4:**

$$F_{2_4} = \begin{bmatrix} 9.3749e-07 & 1.8704e-06 & -0.0010 \\ 1.9561e-06 & 1.3969e-06 & -0.0013 \\ -0.0013 & -0.0015 & 1.0000 \end{bmatrix}$$

5) **Image pair 5:**

$$F_{2_5} = \begin{bmatrix} 1.1694e-06 & -2.3267e-07 & -0.0009 \\ 1.6024e-07 & 5.3137e-08 & -9.7493e-05 \\ -0.0013 & 0.0001 & 1.0000 \end{bmatrix}$$

2 Figures depicting Epipolar Lines, x_1 and x_2

Here are the requested figures:

2.1 Coordinates of F_2

1) Pair 1: Look at Figure 1

- Point 1: Selected on left image

$$x_1 = \begin{bmatrix} 973. \\ 687. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 995. \\ 697. \\ 1. \end{bmatrix} l_2 = \begin{bmatrix} 3.8283877e-04 \\ 4.9301854e-04 \\ -6.6162956e-01 \end{bmatrix}$$

- Point 2: Selected on right image

$$x_1 = \begin{bmatrix} 352. \\ 313. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 377. \\ 313. \\ 1. \end{bmatrix} l_1 = \begin{bmatrix} -2.4095539e-04 \\ -8.4048964e-04 \\ 3.2874948e-01 \end{bmatrix}$$

2) Pair 2: Look at Figure 3

- Point 1: Selected on left image

$$x_1 = \begin{bmatrix} 420. \\ 193. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 452. \\ 191. \\ 1. \end{bmatrix} l_2 = \begin{bmatrix} 1.5099120e-04 \\ 6.0439110e-04 \\ -1.7629284e-01 \end{bmatrix}$$

- Point 2: Selected on right image

$$x_1 = \begin{bmatrix} 440. \\ 493. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 445. \\ 493. \\ 1. \end{bmatrix} l_1 = \begin{bmatrix} 0.00103686 \\ -0.00191995 \\ 0.4618911 \end{bmatrix}$$

3) Pair 3: Look at Figure 5

- Point 1: Selected on left image

$$x_1 = \begin{bmatrix} 301. \\ 20. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 265. \\ 22. \\ 1. \end{bmatrix} l_2 = \begin{bmatrix} -0.0011403 \\ -0.0014089 \\ 0.41179848 \end{bmatrix}$$

- Point 2: Selected on right image

$$x_1 = \begin{bmatrix} 385. \\ 115. \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 352. \\ 113. \\ 1. \end{bmatrix} l_1 = \begin{bmatrix} 1.3249903e-04 \\ 8.8035362e-05 \\ -5.6866527e-02 \end{bmatrix}$$

4) Pair 4: Look at Figure 7

- Point 1: Selected on left image

$$x_1 = \begin{bmatrix} 480 \\ 146 \\ 1 \end{bmatrix} x_2 = \begin{bmatrix} 522 \\ 150 \\ 1 \end{bmatrix} l_2 = \begin{bmatrix} -0.00019784 \\ -0.00011834 \\ 0.11293602 \end{bmatrix}$$

- Point 2: Selected on right image

$$x_1 = \begin{bmatrix} 355 \\ 619 \\ 1 \end{bmatrix} x_2 = \begin{bmatrix} 469 \\ 659 \\ 1 \end{bmatrix} l_1 = \begin{bmatrix} 5.2284281e-04 \\ 2.1014048e-04 \\ -3.7685877e-01 \end{bmatrix}$$

5) Pair 5: Look at Figure 9

- Point 1: Selected on left image

$$x_1 = \begin{bmatrix} 723 \\ 389 \\ 1 \end{bmatrix} x_2 = \begin{bmatrix} 778 \\ 394 \\ 1 \end{bmatrix} l_2 = \begin{bmatrix} -1.0894565e-04 \\ 4.8105852e-05 \\ 5.9066117e-02 \end{bmatrix}$$

- Point 2: Selected on right image

$$x_1 = \begin{bmatrix} 1071 \\ 392 \\ 1. \end{bmatrix} x_2 = \begin{bmatrix} 1146 \\ 397 \\ 1 \end{bmatrix} l_1 = \begin{bmatrix} 2.3414113e-04 \\ 9.4948540e-05 \\ -3.1338805e-01 \end{bmatrix}$$

2.2 Figures

Figure 1. for pair 1 with F_2. For the coordinates please refer to previous sub-section: "Coordinates of F_2". The line appears to closely pass the point.

Figure 2. for pair 2 with F_2. For the coordinates please refer to previous sub-section: "Coordinates of F_2". The line appears to closely pass the point.

Figure 3. for pair 3 with F_2. For the coordinates please refer to previous sub-section: "Coordinates of F_2". The line appears to closely pass the point.

Figure 4. for pair 4 with F_2. For the coordinates please refer to previous sub-section: "Coordinates of F_2". The line appears to not pass the point closely. The reason to this is clear. key point descriptors and detectors are not very good with images that have a lot of repeating patterns. In this case even a human would have a hard time telling the difference between some f the windows.

Figure 5. for pair 5 with F_2. For the coordinates please refer to previous sub-section: "Coordinates of F_2". The line appears to closely pass the point.

3 Epipoles and their Coordinates

3.1 Coordinates

Here is the list:

Figure 6. for pair 1 with F_2 $e_1 = \begin{bmatrix} 2084 \\ -276 \end{bmatrix}$, $e_2 = \begin{bmatrix} 1894 \\ -152 \end{bmatrix}$

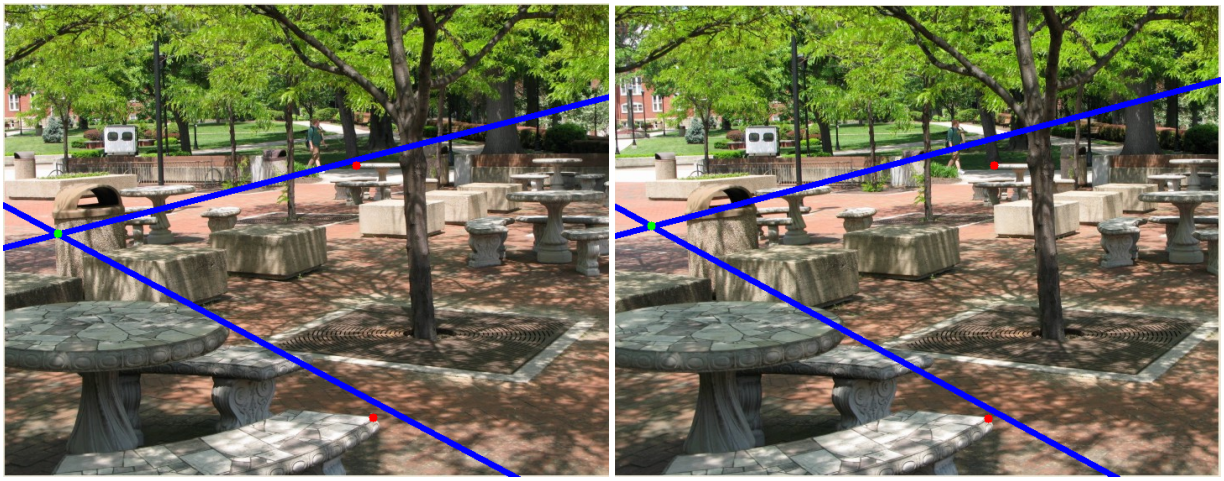

Figure 7. for pair 2 with F_2 $e_1 = \begin{bmatrix} 65 \\ 275 \end{bmatrix}$, $e_2 = \begin{bmatrix} 44 \\ 264 \end{bmatrix}$

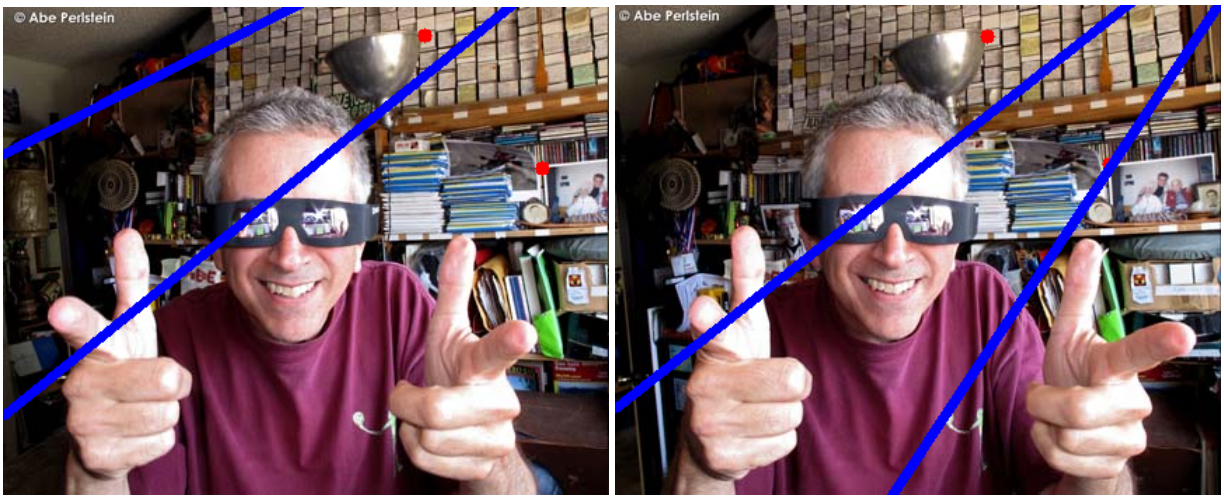

Figure 8. for pair 3 with F_2 $e_1 = \begin{bmatrix} 623 \\ -211 \end{bmatrix}$, $e_2 = \begin{bmatrix} 501 \\ -107 \end{bmatrix}$

Figure 9. for pair 4 with F_2 $e_1 = \begin{bmatrix} -1019 \\ 2656 \end{bmatrix}$, $e_2 = \begin{bmatrix} 736 \\ -39 \end{bmatrix}$

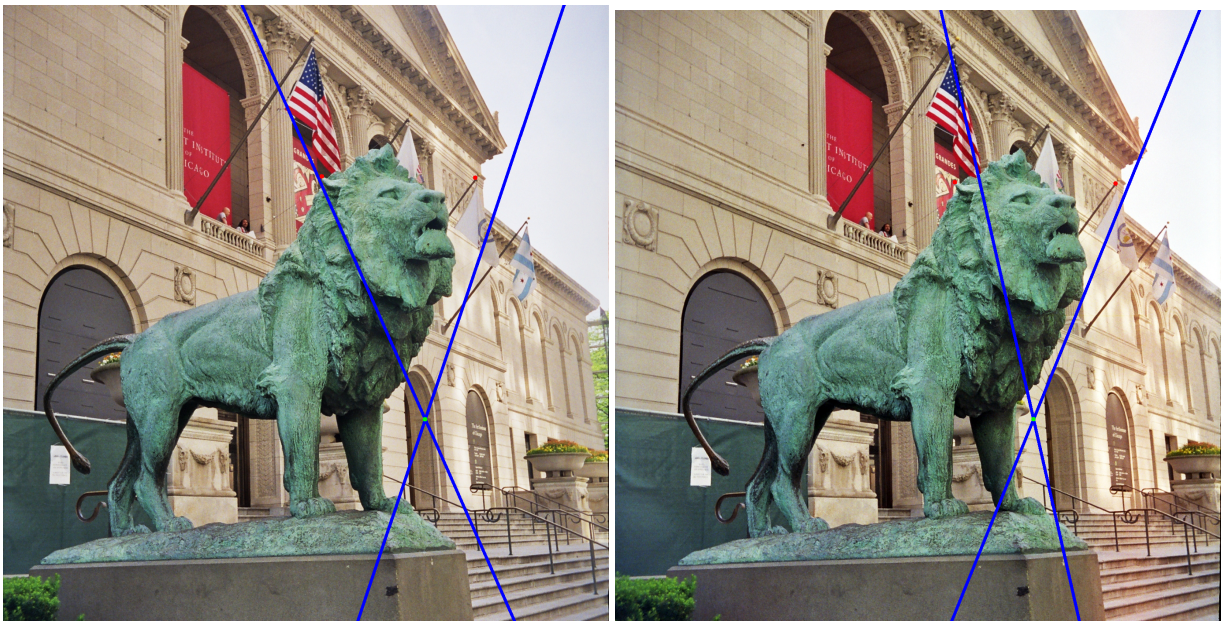

Figure 10. for pair 2 with F_2 $e_1 = \begin{bmatrix} 958 \\ 941 \end{bmatrix}$, $e_2 = \begin{bmatrix} 958 \\ 937 \end{bmatrix}$