Exercise 4

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$$F = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 1 & -1 & 0 \end{bmatrix}$$

$x_1 = (1, 0, 1)^T \qquad x_2 = (2, 1, 1)$

$l' = Fx$

$l_1 = Fx_1$ (epipolar line 1)

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$

$l_2' = Fx_2$ (epipolar line 2)

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$l_1' \times l_2' = e$

$$\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} \times \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} \qquad e' = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$$

check. ~~$F^T e' = 0$~~ $F e' = 0$

$$\begin{bmatrix} 0 & 1 & 1 \\ 1 & -1 & -1 \\ 0 & 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

If the system changes from convergent to a stereo-normal view, then the epipoles "e" and "e'" will be located at infinity.