DATA.ML.300

Exercise Round 6

1.

a)

The purposes of essential and fundamental matrices (E, F) are used in multiple (two) view geometry to mapping image point $\mathbf{x}$ in the first image to a (epipolar) line in the second image by performing the multiplication $E\mathbf{x}/F\mathbf{x}$. If we then want to find a point correspondence for $\mathbf{x}$ in the second image, the search space is restricted only to the projected epipolar line. Even though both matrices E and F can be used to calculate this mapping, there are strict situations whenever the other is used. If we know only the normalized image coordinates, then the essential matrix should be used. To calculate the normalised image coordinates, the camera's intrinsic parameters has to be known. On the other hand, if only the image coordinates are known, then the fundamental matrix should be used.

b)

You can derive the essential matrix from fundamental matrix if you know the intrinsic parameters of the two cameras (the matrices K and K'). By definition $F = K'^{-T}EK^{-1}$, so $E = K'^{T}FK$

c)

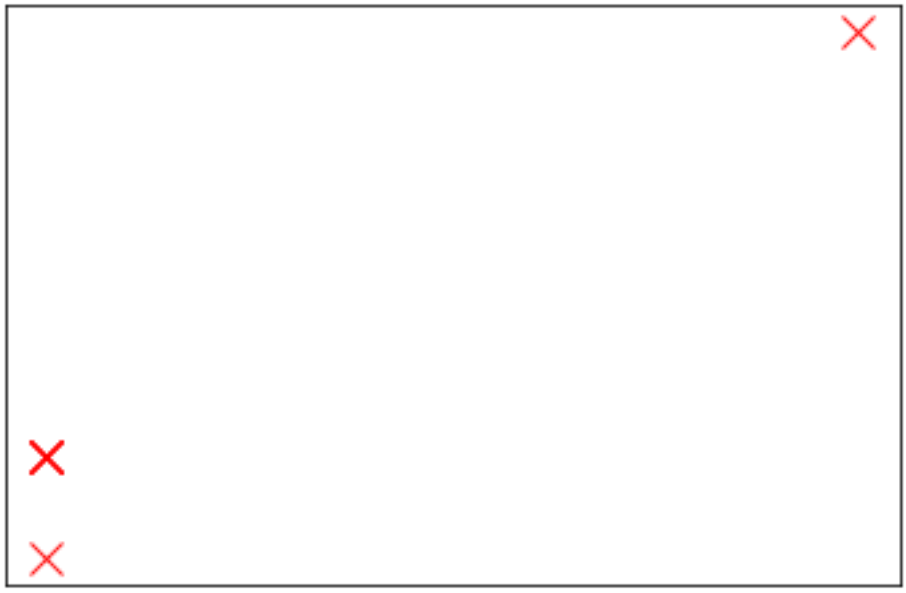
Fundamental matrix has seven degrees of freedom. Firstly, because the scaling of this matrix doesn't matter, it drops one dof. Secondly, because fundamental matrix is singular (determinant equals zero), it drops one dof. Therefore total degrees of freedom equals seven.

d)

Essential matrix has five degrees of freedom. Essential matrix is defined by translation (3 dof) and rotation (dof) which adds up to 6 dof. However, the scaling doesn't have affect and therefore one dof is dropped out. This adds up to five degrees of freedom.

2.

There seems to be some error in my code since the output I get looks like this.



I couldn’t find the error but maybe it is still worth of something since there isn’t any parts missing in the code.

3.

Picture width: 0.21 mm

Picture height: 1.85 mm