Fundamental matrix arising from special motions

The fundamental matrix represents the geometric relationship between two camera views and it is used to estimate the corresponding points in different images. The fundamental matrix exhibits distinct properties and characteristics based on the rotation and translation of one camera with respect to the other.

General motion refers to a combination of translation and rotation of the camera.
We can:

1. rotate the first camera so that it is aligned with the second one
2. correct the first image to account for differences in calibration matrices

Result of these two corrections is a projective transformation $H = K' R K^{-1}$
We end up in a pure translation case.

$$F = [e']_\times H$$

In **pure translation** one camera undergoes a linear motion without any rotation or change in intrinsic parameters. This motion can be described as a simple displacement of the camera along a straight line.
In general:

$$\left.\begin{aligned} P &= K[I \mid 0] \\ P' &= K'[R \mid t] \end{aligned}\right\} \quad F = [e']_\times K K^{-1}$$

In this case one may assume that:

$$\left.\begin{aligned} P &= K[I \mid 0] \\ P' &= K[I \mid t] \end{aligned}\right\} \quad F = [e']_\times K K^{-1} = [e']_\times$$

Pure planar motion occurs when the camera undergo a motion in which the rotation is orthogonal to the translation direction.