

4. Find all points, which are projected into itself by homography

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

$$\lambda \vec{x} = H \vec{x}$$

$$\lambda \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \rightarrow \begin{array}{l} \lambda x_1 = x_1 + x_3 \rightarrow (\lambda - 1)x_1 = x_3 \\ \lambda x_2 = x_2 \rightarrow (\lambda - 1)x_2 = 0 \\ \lambda x_3 = x_3 \rightarrow (\lambda - 1)x_3 = 0 \end{array} \quad \textcircled{A}$$

$\begin{array}{l} \rightarrow \lambda = 1 \\ \rightarrow x_3 = 0 \end{array}$

$$\lambda = 1 \xrightarrow{\textcircled{A}} x_3 = 0 \rightarrow \vec{x} = \begin{bmatrix} a \\ b \\ 0 \end{bmatrix} \checkmark$$

$$x_3 \neq 0 \wedge \lambda \neq 1$$

$$\rightarrow \vec{x} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \times$$

DOES NOT REPRESENT
A POINT IN PROJECTIVE PLANE

$x_3 = 0$ EVERYTIME

- \rightarrow H MUST BE MAPPING
IN PROJECTIVE COORDINATES
- FOR AFFINE COORDINATES WOULD
BE $x_3 \neq 0$