Lecture 4

2022-01-24

This is a test.

Homography

Is this a test?

$$\lambda \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{pmatrix} h_1 & h_2 & h_3 \\ h_4 & h_5 & h_6 \\ h_7 & h_8 & 1 \end{pmatrix} \cdot \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Camera rotation and translation

$$\tilde{\mathbf{X}}_c = \mathbf{R}(\tilde{\mathbf{X}} - \tilde{\mathbf{C}}) \quad \begin{pmatrix} \tilde{\mathbf{X}}_c \\ 1 \end{pmatrix} = \begin{bmatrix} \mathbf{R} & -\mathbf{R}\tilde{\mathbf{C}} \\ \mathbf{0} & 1 \end{bmatrix} \begin{pmatrix} \tilde{\mathbf{X}} \\ 1 \end{pmatrix}$$

$$\mathbf{X}_c = \begin{bmatrix} \mathbf{R} & -\mathbf{R}\tilde{\mathbf{C}} \\ \mathbf{0} & 1 \end{bmatrix} \mathbf{X}$$

$$\mathbf{x} = \mathbf{K}[\mathbf{I} \mid \mathbf{0}] \begin{bmatrix} \mathbf{R} & -\mathbf{R}\tilde{\mathbf{C}} \\ \mathbf{0} & 1 \end{bmatrix} \mathbf{X}$$

$$\mathbf{x} = \mathbf{K}[\mathbf{R} \mid -\mathbf{R}\tilde{\mathbf{C}}]\mathbf{X}, \quad \mathbf{t} = -\mathbf{R}\tilde{\mathbf{C}}$$

$$\mathbf{x} = \mathbf{K}[\mathbf{R} \mid \mathbf{t}]\mathbf{X}$$

- x: point in image coordinates (homogeneous)
- $[\mathbf{I}|0]$: 3×4 projection matrix
- K: 3×3 2D transformation (calibration matrix)
- $[\mathbf{R} \mid \mathbf{t}]$: 3×4 camera pose (extrinsic) matrix

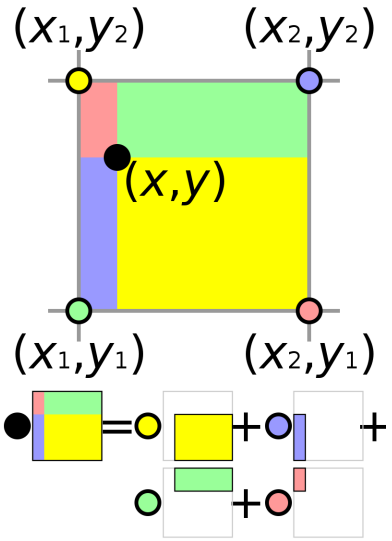

Figure 1: Interpolation (Bilinear interpolation)