

## Tutorial 2

### Image Calibration and Interpolation

1. A camera has an intrinsic matrix:

$$K = \begin{bmatrix} 1000 & 0 & 320 \\ 0 & 1000 & 240 \\ 0 & 0 & 1 \end{bmatrix}$$

and the world point  $X$  (150, 200, 1000) is imaged. Compute the image coordinates  $(x, y)$  by using camera matrix.

2. The camera undergoes a rotation of  $30^\circ$  about the  $Y$ -axis, and its translation is (50 mm, 20 mm, 10 mm). Given a world point (100 mm, 200 mm, 500 mm), determine its new position in the camera coordinate frame.
3. A pinhole camera has a focal length of 50 mm. An object of height 200 mm is placed 1000 mm in front of the camera.

(a) What will be the height of the object's image on the image plane?

(b) If the image sensor has a pixel size of 0.01 mm, how many pixels tall will the image be?

4. Given a set of four neighboring pixel values from a digital image,

$$\begin{bmatrix} 50 & 80 \\ 60 & 100 \end{bmatrix}$$

Rescale the portion by a factor of 1.5 using bilinear interpolation.