

# Computervision Lab 4

## Image transformations

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### 1 Geometric transformations

In this lab we discuss some types of two-dimensional geometric transformations. These are transformations that convert a plane into another plane. Examples are translation, rotation, scaling, affine transformation and perspective transformation.

Translation, rotation and scaling speak for themselves. Affine transformations are all transformations that maintain collinearity and distance relationships. Each affine transformation can be seen as a combination of translation, rotation, scaling, and shear. Perspective transformations (also called homography) are transformations that only retain linearity.



Figure 1: Original image (left), shear transformation (central), perspective transformation (right).

### 2 Exercise 8

Write a program that draws the shadow of the photographer in **shadow.png** vertically with a shear transformation. The transformation matrix to shear horizontally has this form:

$$\begin{bmatrix} 1 & m & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

where  $m$  is the shear factor. You can add translation by placing pixel offsets in the third column. New features: **warpAffine**.

### 3 Exercise 9

Write a program that ensures that the photographer in **shadow\_box.png** not only stands vertically, but is also proportionally correct. In your program you click on the 4 corners of the tetragon that you want to transform into a rectangle, after which the right perspective transformation is searched for and executed. Features you need: **setMouseCallback**, **getPerspectiveTransform**, **warpPerspective**.

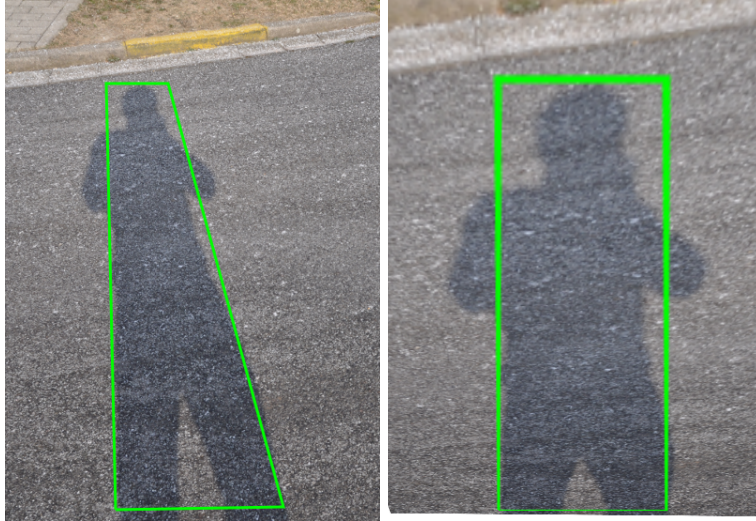


Figure 2: Origineel beeld (links), gerespecticeerd (rechts).

### 4 Report

Write a short report about how you solved the exercises. Include in this report your input and output images. Describe every new function that you used. Explain the basic algorithm and purpose of the functions and clarify the parameters and how you selected them. Upload your report in the form of **LabX\_name.pdf** to the dropbox on Minerva.