Università
della
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Faculty
of Informatics

Computer Vision & Pattern Recognition

Spring 2025

Assignment 2

February 25, 2025

Problem 1

Suppose we scale a given image by a scale factor of $c = 0.25$, using backward mapping and bilinear interpolation (see slide 28). Work out the formula for the intensity of the (i, j)-th pixel of the target image, that is, express $a^2_{i,j}$ in terms of the source image intensities $a^1_{k,l}$. Compare this to the result that we get when using the simple algorithm from slide 14 for zooming out by a factor of $z = 1/c = 4$. What is better? What changes if we use the scale factor $c = 0.2$?

Problem 2

Write a program that rotates a grayscale image about its centre, using the decomposition of the rotation into a product of 3 shears, as shown in class (slide 29). For the implementation of each of the three shears, use one-dimensional linear interpolation in the direction of the shear. Embed the rotated image at the centre of a canvas that is twice as wide and twice as high as the input. Fill any empty space of the image with a default intensity of 255.

Use your program to rotate the "watch" image (`watch.pgm`) by $25°$. Compute the average intensity of the difference between the result and the result that you get if you rotate the image with the code from the lecture (rotation with inverse mapping and bilinear interpolation: `03.28 inverse mapping.py`).

Solutions must be returned on March 4, 2025 via iCorsi