

SGN-31007 Advanced Image Processing

Exercise 4, 31.01.2018

Problem 1 (4 points)

Let $z = y + \eta$, where $\eta \sim \mathcal{N}(0, \sigma^2)$, $\sigma = 0.5$. For a given point x_0 we have already computed two estimates,

$$\hat{y}_1 = 0.3 \quad \text{and} \quad \hat{y}_2 = 0.9,$$

using two different kernels

$$g_1 = \frac{1}{3} [\mathbf{111}] \quad \text{and} \quad g_2 = \frac{1}{5} [\mathbf{11111}].$$

Note that the **bold** indicates the origin.

Which of the two estimates $\hat{y}_1(x_0)$, $\hat{y}_2(x_0)$ will be selected as the adaptive estimate by the ICI with threshold parameter $\Gamma = 1$? Give a detailed explanation of the reason.

Problem 2 (3 points)

Consider the kernel

$$g = [g[1], g[2]].$$

Find the values $g[1]$ and $g[2]$ that minimize the variance of the estimate.

Problem 3 (3 points)

In this page you will find a Matlab package for Anisotropic Nonparametric Image Restoration DemoBox. Please, download it. Open **demo_DenoisingGaussian.m** and execute this demo program for different input parameters: *gammaICI*, and *directional_resolution*.

Investigate how denoising performance depend on the choice of these parameters by setting *gammaICI* values from the set $\{0.8, 1, 1.5, 2.5\}$ and setting *directional_resolution* from the set $\{4, 8, 16\}$. Explain the obtained results. Check how the optimal window sizes change for each of the above mentioned setups.