BIL 717 - Image Processing

HACETTEPE UNIVERSITY
Department of Computer Engineering

Problem Set 1
Spring '2011-2012
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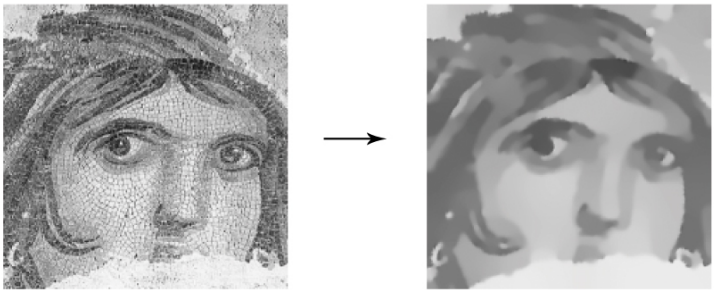
Filtering in Spatial Domain

Due Date: 01:30pm on Tuesday, March 20th, 2012



Overview

The goal of this assignment is to smooth images using PDE-based diffusion models.

Details

You will implement a Perona-Malik (PM) type nonlinear diffusion model [1]. Your program will take a grayscale image as input and produce a smoothed version of it as output. It should have the following structure:

1. Read the input image.
2. Set the parameters of the model.
    - contrast threshold: λ
    - scale parameter: σ
    - diffusion time: T
3. Perform smoothing.

You are provided a linear diffusion code. You can use this code as a skeleton and make the necessary changes to implement the PM model.

In your reports and the related experiments, you should address the following issues:

- Relation between linear diffusion and Gaussian filtering (see Matlab functions `imfilter` and `fspecial`).
- Comparison of the results of linear and PM type nonlinear diffusion.
- Effects of the parameters on the smoothing results (both for linear and PM diffusion)
- Changes in the mean intensity value, the variance of the intensities and total gradient magnitude throughout iterations.

What to Hand In

You are required to submit all your code along with a short report in *HTML*. For that purpose, prepare a folder containing

- `README.txt` *(text file containing details about your project)*
- `code/` *(directory containing all your code)*
- `html/` *(directory containing all your html report, including your images)*
- `html/index.html` *(html report)*

Archive this folder as `pset1.zip` and email to my email address (`erkut@cs.hacettepe.edu.tr`).

Your HMTL report should contain a brief overview of the problem, and your comments about the experimental analysis on the aforementioned issues. Please do not include any code in your reports.

References

[1] P. Perona and J. Malik. Scale-space and edge detection using anisotropic diffusion. IEEE Trans. Pattern Anal. Mach. Intell., 12:629639, 1990.