Computer exercise 6
Image filtering and feature extraction
Statistical image analysis, TMS016

1 Introduction

The purpose of this computer exercise is to give an introduction to image filtering and feature extraction. When in doubt about how to use a specific function in Matlab, use `help` and `doc` to get more information.

2 Image filtering

Throughout the exercise, we will use the image `rice.png` which is supplied with Matlab. Load it by writing I = `I = imread('rice.png');` and convert it to double values.

- Test filtering the image with som different smoothing filters, using the function `conv2`.

- Filter the image using horizontal and vertical edge detection filters and compute the Prewitt-filtererd image.

3 Morphological operations

- Create a binary image by segmenting the image into two classes based on the greyscale values using a GMM (as in computer exercise 5).

- Compute the image erosion, dilation, and opening using a circular structure element with different radii r and plot the results. A circular structure element can be constructed using `strel('disk',r)`, and you can compute the erosion, dilation, and opening using `imerode`, `imdilate`, and `imopen`, respectively. Make sure that you understand what these operations are doing.

4 Improved segmentation

A problem with segmenting the image using a mixture model is that the intensity of the background has a clear spatial trend. We can therefore improve the segmentation by first estimating the background, removing it, and then segmenting the updated image.

- Use `imopen` with a circular structure element to estimate the background of the grayscale image. Plot the image opening for different values of r to find a suitable value.

- Subtract the estimated background from the image and plot the results.

- Segment the image into two classes using a GMM and compare the result to the segmentation without the background removal.