TD3 - Mathematical Morphology
Grayscale morphological filtering

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Introduction

This assignment aims to illustrate mathematical morphology filtering on grayscale images (chapter 2). You'll have to choose and implement some filtering methods using Matlab.

Exercise 1 : Correction of uneven background

In this exercise, you are supposed to segment the text from the image 'unevenbackground.tif' and get a binary image with all the letters.

1. Can this be done using a global threshold ?
2. Propose a method using a morphological operator.

Exercise 2 : Defects segmentation

In this exercise, you are supposed to write a Matlab script to detect defects in a microelectronic circuit, as shown in Figure 1. The input image is a gray-scale image of a microelectronic circuit. The relevant objects in this image are vertical metal stripes. These stripes have some irregularities that should be detected. Our procedure takes the residues of a gray-scale closing and filter (by size) the threshold of the residues.

$\Rightarrow$ Propose a procedure to filter the presented irregularities. $\Rightarrow$ Comment your choices (structuring elements, sequence of operations) and results.

Useful commands : strel, bwareaopen, im2bw.

Exercise 3 : Granulometry

The objective is to understand the granulometry method to get information about the size distribution of objects in an image. You will work on several cases to have a complete view of the method and its interpretation.

1. Start with the image circles.jpg : use granulometry to determine the size of the circles in the image and to analyse their spatial distribution. Complete the code. Comment the results and graphs.

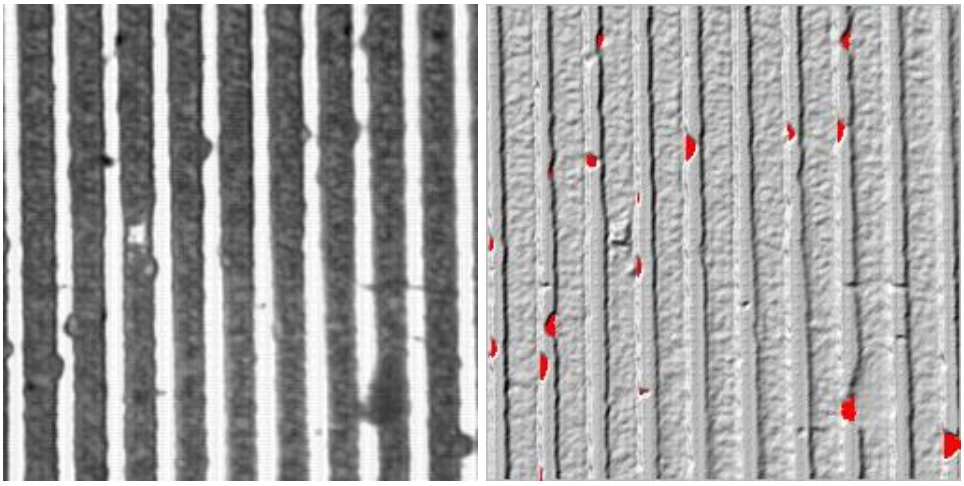

Figure 1: a microelectronic circuit and detected defects

2. Repeat the previous steps on the following images: circlesLines.jpg, GranBin.png. Comment carefully the results.

3. Now, you have to analyse some images according to the granulometry of their content. Load the different images of wall ($wall_{xxx}.png$). Propose a complete granulometry analysis to get information about wall brick structure (length, thickness, gap between bricks). Choose appropriate structuring elements and plot the granulometry curves corresponding to the three images on the same graph and discuss your results.