SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19EC513 – IMAGE PROCESSING AND COMPUTER VISION

III YEAR / V SEMESTER

Unit IV- MORPHOLOGICAL IMAGE PROCESSING

Topic : Opening for binary and gray image

Grayscale Morphology

Morphological transformations extract and alter the structure of particles in an image. They fall into two categories:
•Binary Morphology functions, which apply to binary images
•Grayscale morphology functions, which apply to gray-level images
In grayscale morphology, a pixel is compared to those pixels surrounding it in order to keep the pixels whose values are the smallest (in the case of an erosion) or the largest (in the case of a dilation).

When to Use
Use grayscale morphology functions to filter or smooth the pixel intensities of an image. Applications include noise filtering, uneven background correction, and gray-level feature extraction.

Concepts

The gray-level morphology functions apply to gray-level images. You can use these functions to alter the shape of regions by expanding bright areas at the expense of dark areas and vice versa. These functions smooth gradually varying patterns and increase the contrast in boundary areas. This section describes the following gray-level morphology functions:

- Erosion
- Dilation
- Opening
- Closing
- Proper-opening
- Proper-closing
- Auto-median

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These functions are derived from the combination of gray-level erosions and dilations that use a structuring element.
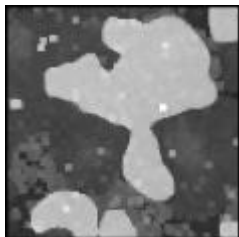
Erosion Function

A gray-level erosion reduces the brightness of pixels that are surrounded by neighbors with a lower intensity. The neighborhood is defined by a structuring element.
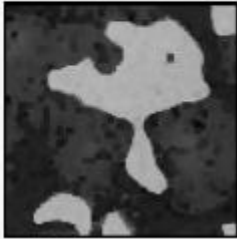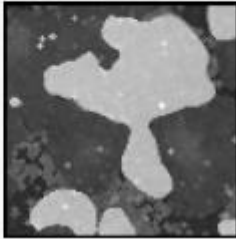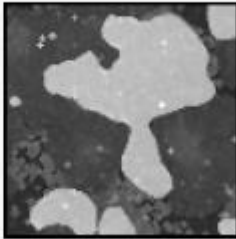
Dilation Function

A gray-level dilation increases the brightness of each pixel that is surrounded by neighbors with a higher intensity. The neighborhood is defined by a structuring element. The gray-level dilation has the opposite effect of the gray-level erosion because dilating bright regions also erodes dark regions.

Erosion and Dilation Examples

The following table provides example structuring elements and the corresponding eroded and dilated images.

Structuring Element			Erosion	Dilation
1	1	1		
1	1	1		
1	1	1		
0	1	0		
1	1	1		
0	1	0		

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Opening Function

The gray-level opening function consists of a gray-level erosion followed by a gray-level dilation. It removes bright spots isolated in dark regions and smooths boundaries. The effects of the function are moderated by the configuration of the structuring element.

opening(*I*) = *dilation*(*erosion* (*I*))

This operation does not significantly alter the area and shape of particles because erosion and dilation are morphological opposites. Bright borders reduced by the erosion are restored by the dilation. However, small bright particles that vanish during the erosion do not reappear after the dilation.

THANK YOU !!!

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