SNS COLLEGE OF ENGINEERING

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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 : Basic concept, Dilation process for binary and gray image

Dilation

Brief Description

Dilation is one of the two basic operators in the area of mathematical morphology, the other being erosion. It is typically applied to binary images, but there are versions that work on grayscale images.

The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels (*i.e.* white pixels, typically). Thus areas of foreground pixels grow in size while holes within those regions become smaller.

How It Works

Useful background to this description is given in the mathematical morphology section of the Glossary.

The dilation operator takes two pieces of data as inputs. The first is the image which is to be dilated. The second is a (usually small) set of coordinate points known as a structuring element (also known as a *kernel*). It is this structuring element that determines the precise effect of the dilation on the input image.

The mathematical definition of dilation for *binary* images is as follows:
Suppose that *X* is the set of Euclidean coordinates corresponding to the input binary image, and that *K* is the set of coordinates for the structuring element.

Let *Kx* denote the translation of *K* so that its origin is at *x*.
Then the dilation of *X* by *K* is simply the set of all points *x* such that the intersection of *Kx* with *X* is non-empty.

The mathematical definition of grayscale dilation is identical except for the way in which the set of coordinates associated with the input image is derived. In addition, these coordinates are 3-D rather than 2-D.

As an example of binary dilation, suppose that the structuring element is a 3×3 square, with the origin at its center, as shown in Figure 1. Note that in this and subsequent diagrams, foreground pixels are represented by 1's and background pixels by 0's.

1	1	1
1	1	1
1	1	1

Set of coordinate points =

{ (-1, -1), (0, -1), (1, -1),
(-1, 0), (0, 0), (1, 0),
(-1, 1), (0, 1), (1, 1) }

Figure 1 A 3×3 square structuring element

To compute the dilation of a binary input image by this structuring element, we consider each of the *background* pixels in the input image in turn.

For each background pixel (which we will call the *input pixel*) we superimpose the structuring element on top of the input image so that the origin of the structuring element coincides with the input pixel position.

If *at least one* pixel in the structuring element coincides with a foreground pixel in the image underneath, then the input pixel is set to the foreground value. If all the corresponding pixels in the image are background, however, the input pixel is left at the background value.

THANK YOU !!!