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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-25

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OUTLINE

- Erosion
- Erosion – Example 1
- Erosion – Example 2
- Duality between dilation and erosion
- Erosion and Dilation summary
- MCQ
- References

Erosion

•Erosion is used for shrinking of element A by using element B

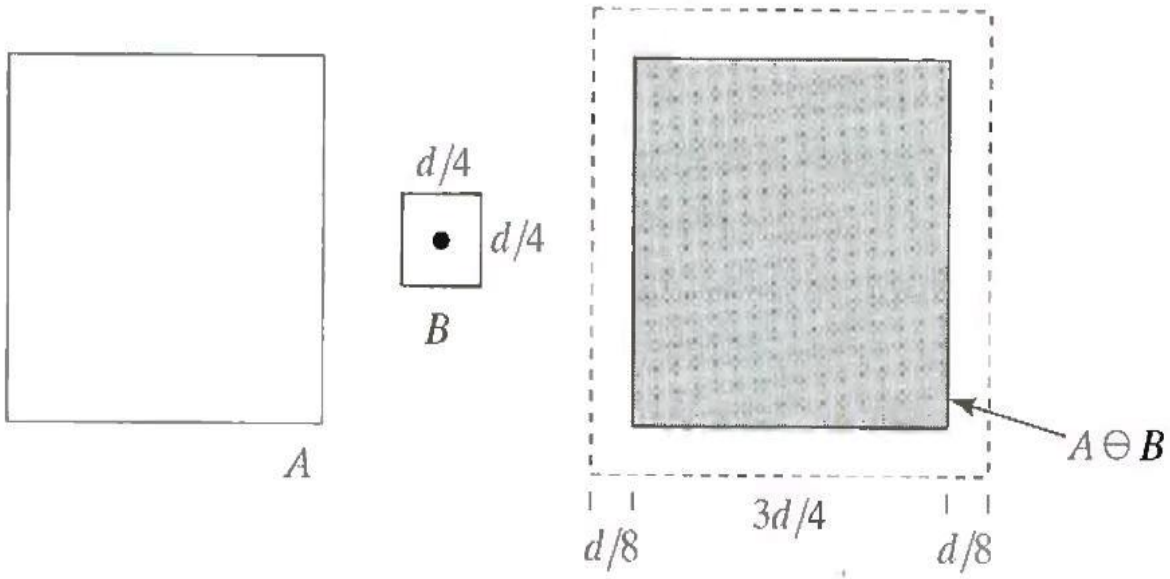
•Erosion for Sets A and B in Z2, is defined by the following equation:

$$A \ominus B = \{z|[(B)z \subseteq A\} \quad (9.2-3)$$

•This equation indicates that the erosion of A by B is the set of all points z such that B, translated by z,

is combined in A.

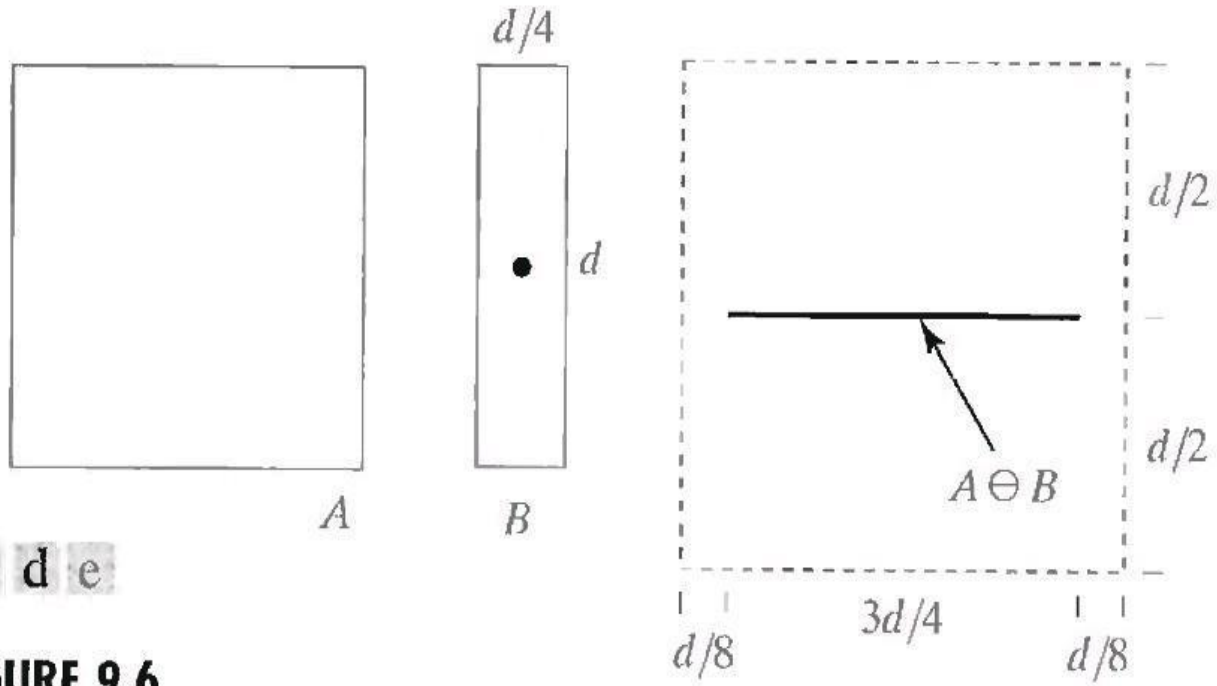
Erosion – Example 1



a b c

FIGURE 9.6 (a) Set A. (b) Square structuring element. (c) Erosion of A by B, shown shaded

Erosion – Example 2



a d e

FIGURE 9.6

(a) Set A. (d) Elongated structuring element. (e) Erosion of A using this element.

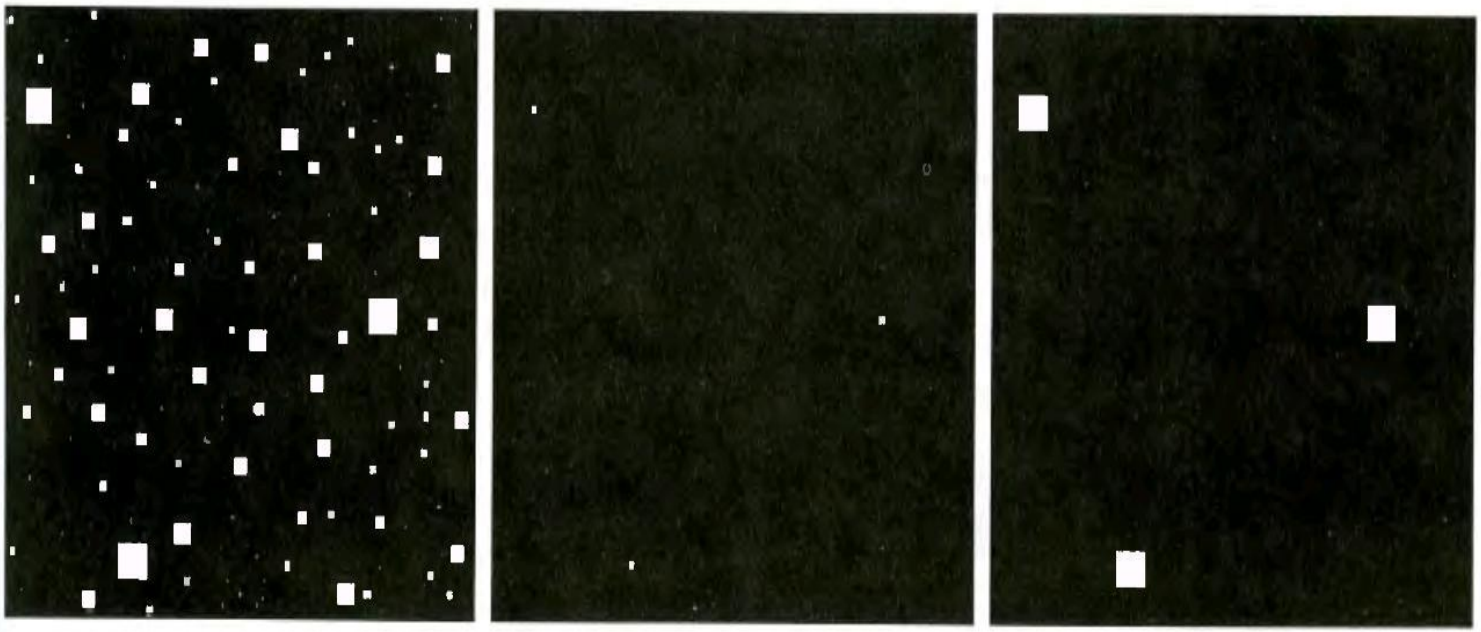
Duality between dilation and erosion

•Dilation and erosion are duals of each other with respect to set complementation and reflection. That is,

$$(A \ominus B)^c = A^c \oplus \hat{B}$$

•One of the simplest uses of erosion is for eliminating irrelevant details (in terms of size) from a binary image.

Erosion and Dilation summary



a b c

FIGURE 9.7 (a) Image of squares of size 1, 3, 5, 7, 9, and 15 pixels on the side. (b) Erosion of (a) with a square structuring element of 1's, 13 pixels on the side. (c) Dilation of (b) with the same structuring element.

MCQ

1. If in an image there exist similar change in gray-level values in the image, which of the following shows a stronger response using second order derivative operator for sharpening?
   a) A line
   b) A step
   c) A point
   d) None of the mentioned
2. Sharpening is analogous to which of the following operations?
   a) To spatial integration
   b) To spatial differentiation
   c) All of the mentioned
   d) None of the mentioned

3. Which of the following fact(s) is/are true about sharpening spatial filters using digital differentiation?
   a) Sharpening spatial filter response is proportional to the discontinuity of the image at the point where the derivative operation is applied
   b) Sharpening spatial filters enhances edges and discontinuities like noise
   c) Sharpening spatial filters deemphasizes areas that have slowly varying gray-level values
   d) All of the mentioned

MCQ

4. Which of the facts(s) is/are true for the first order derivative of a digital function?

a) Must be nonzero in the areas of constant grey values

b) Must be zero at the onset of a gray-level step or ramp discontinuities

c) Must be nonzero along the gray-level ramps

d) None of the mentioned

5. What is the tool used in tasks such as zooming, shrinking, rotating, etc.?

a) Sampling

b) Interpolation

c) Filters

d) None of the Mentioned

References

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