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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-30

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OUTLINE

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Thinning

•The thinning of a set A by a structuring element B, can be defined by terms of the hit-and-miss transform:

$$A \otimes B = A - (A \circledast B) = A \cap (A \circledast B)^c$$

•A more useful expression for thinning A symmetrically is based on a sequence of structuring elements:

• {B}={B1, B2, B3, …, Bn}

•Where Bi is a rotated version of Bi-1. Using this concept we define thinning by a sequence of structuring elements:

$$A \otimes \{B\} = ((\ldots((A \otimes B^1) \otimes B^2)\ldots) \otimes B^n)$$

Thinning

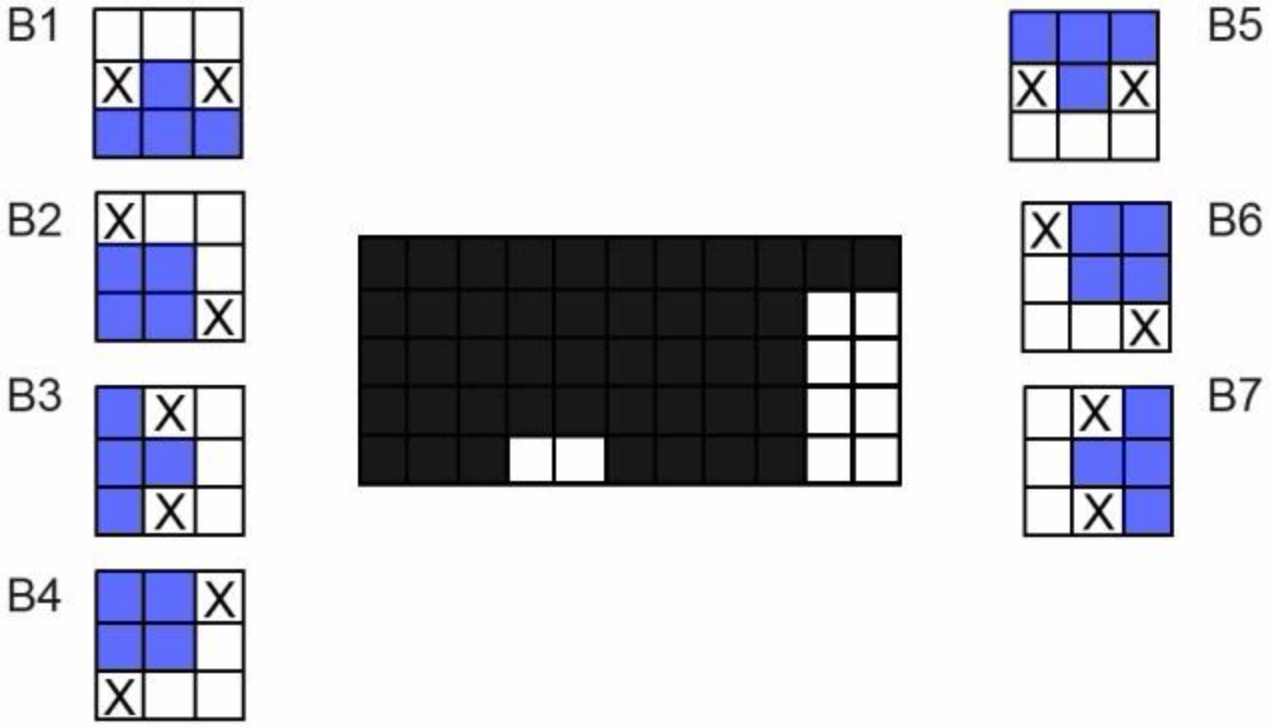
•The process is to thin by one pass with B1 , then thin the result with one pass with B2, and so on until A is thinned with one pass with Bn.

•The entire process is repeated until no further changes occur.

•Each pass is preformed using the equation:

$$A \otimes B = A - (A \circledast B) = A \cap (A \circledast B)^c$$

Thinning example



Thickening

•Thickening is a morphological dual of thinning.

•Definition of thickening .

•As in thinning, thickening can be defined as a sequential operation:

$$A \odot \{B\} = ((\ldots((A \odot B^1) \odot B^2)\ldots) \odot B^n)$$

•the structuring elements used for thickening have the same form as in thinning, but with all 1's and 0's interchanged.

Thickening

•A separate algorithm for thickening is often used in practice, Instead the usual procedure is to thin the background of the set in question and then complement the result.

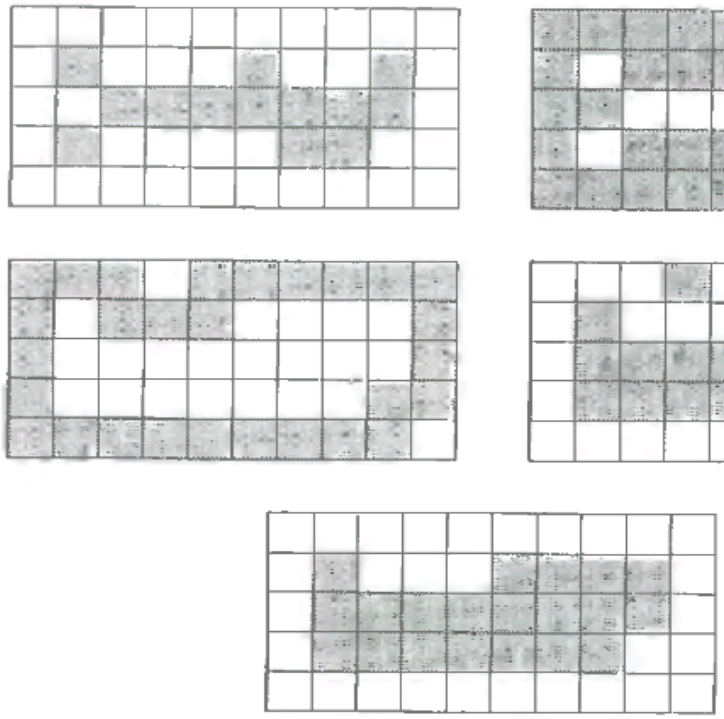
•In other words, to thicken a set A, we form C=Ac , thin C and than form Cc.

•depending on the nature of A, this procedure may result in some disconnected points. Therefore thickening by this procedure usually require a simple post-processing step to remove disconnected points.

Thickening example preview

•We will notice in the next example 9.22(c) that the thinned background forms a boundary for the thickening process, this feature does not occur in the direct implementation of thickening

•This is one of the reasons for using background thinning to accomplish thickening.



MCQ

1. What does Image Differentiation enhance?
   a) Edges
   b) Pixel Density
   c) Contours
   d) None of the mentioned

2. What does Image Differentiation de-emphasize?
   a) Pixel Density
   b) Contours
   c) Areas with slowly varying intensities
   d) None of the mentioned

3. The requirements of the First Derivative of a digital function:
   a) Must be zero in areas of constant intensity
   b) Must be non-zero at the onset of an intensity step
   c) Must be non-zero along ramps
   d) All of the Mentioned

MCQ

4. What is the Second Derivative of Image Sharpening called?

   a) Gaussian

   b) Laplacian

   c) Canny

   d) None of the mentioned

5. Where do you find frequent use of Gradient?

   a) Industrial inspection

   b) MRI Imaging

   c) PET Scan

   d) None of the mentioned

References

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