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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-32

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OUTLINE

❖**Erosion– Gray-Scale**

❖**Opening And Closing**

❖**MCQ**

❖**References**

Erosion– Gray-Scale

Gray-scale erosion is defined as:

$$(f \ominus b)(s,t) = \min\{f(s+x, t+y) - b(x,y) | (s+x), (t+y) \in D_f, (x,y) \in D_b\}$$

The condition that (s+x),(t+y) have to be in the domain of f, and x,y have to be in the domain of b, is

completely analogous to the condition in the binary definition of erosion, where the structuring element

has to be completely combined by the set being eroded.

The same as in erosion we illustrate with 1-D function

$$(f \ominus b)(s) = \min\{f(s+x) - b(x) | (s+x) \in D_f \text{ and } x \in D_b\}$$
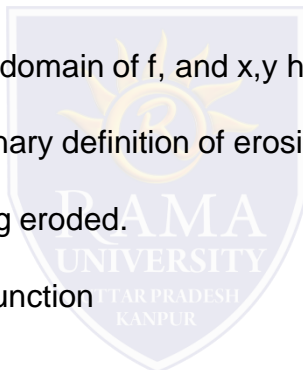
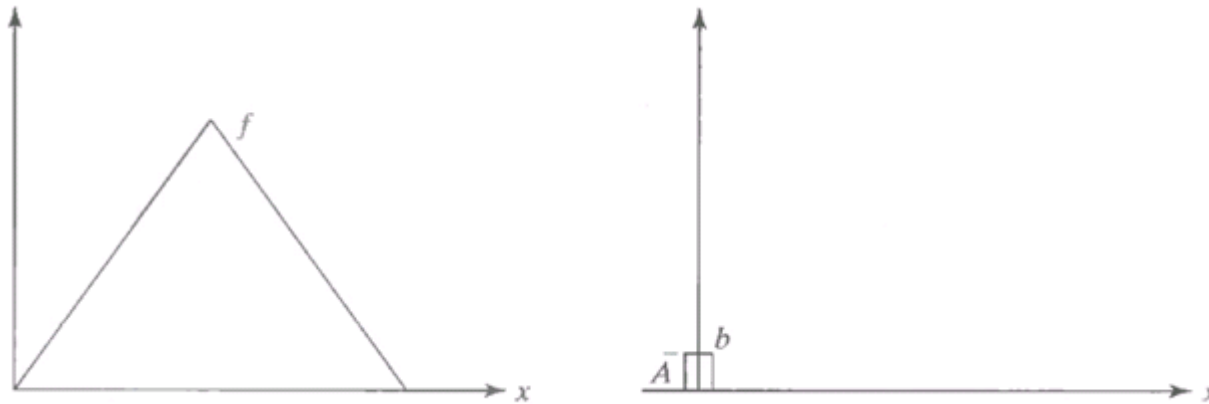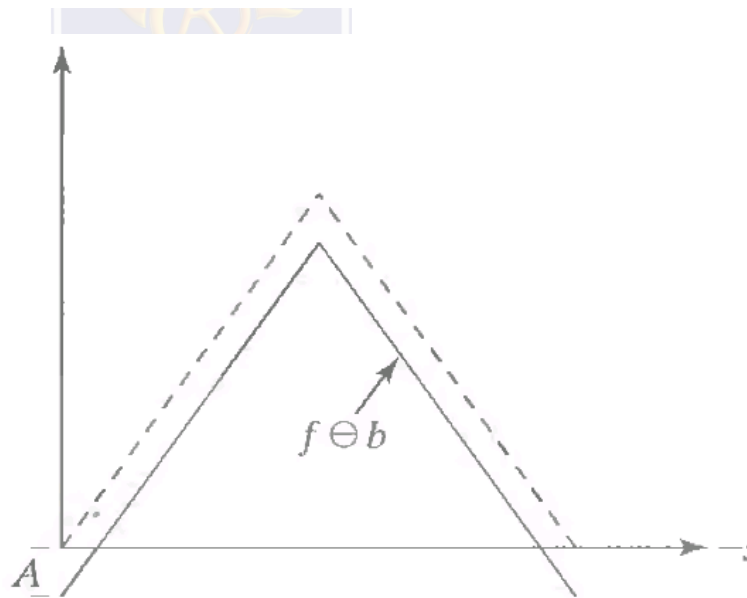**FIGURE 9.28**
Erosion of the
function shown in
Fig. 9.27(a) by the
structuring
element shown in
Fig. 9.27(b).

General effect of performing an erosion in grayscale images:

1.   If all elements of the structuring element are positive, the output image tends to be darker

than the input image.

2.   The effect of bright details in the input image that are smaller in area than the structuring

element is reduced, with the degree of reduction being determined by the grayscale values

surrounding by the bright detail and by shape and amplitude values of the structuring

element itself.

Similar to binary image grayscale erosion and dilation are duals with respect to function

complementation and reflection.

Dilation

Original
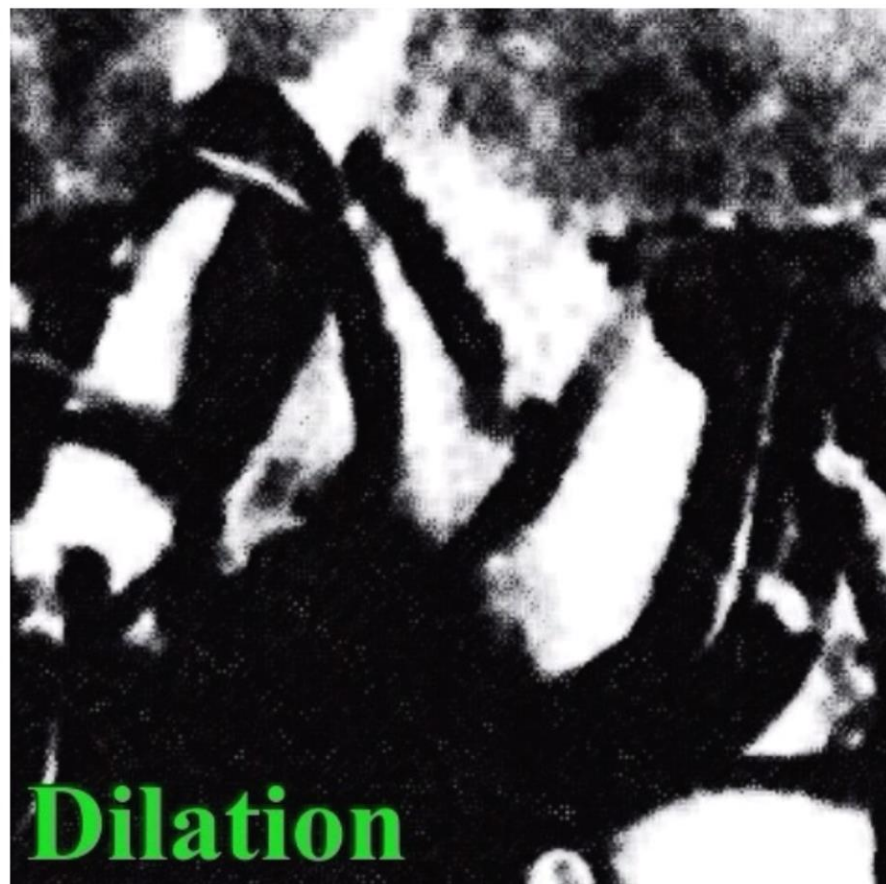
Opening And Closing

• Similar to the binary algorithms

• Opening –

$$f \circ b = (f \ominus b) \oplus b.$$

• Closing –

$$f \bullet b = (f \oplus b) \ominus b.$$

• In the opening of a gray-scale image, we remove small light details, while relatively undisturbed

overall gray levels and larger bright features

• In the closing of a gray-scale image, we remove small dark details, while relatively undisturbed

overall gray levels and larger dark features
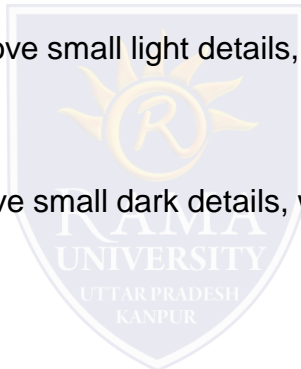
•Opening a G-S picture is describable as pushing object B under the scan-line graph, while traversing
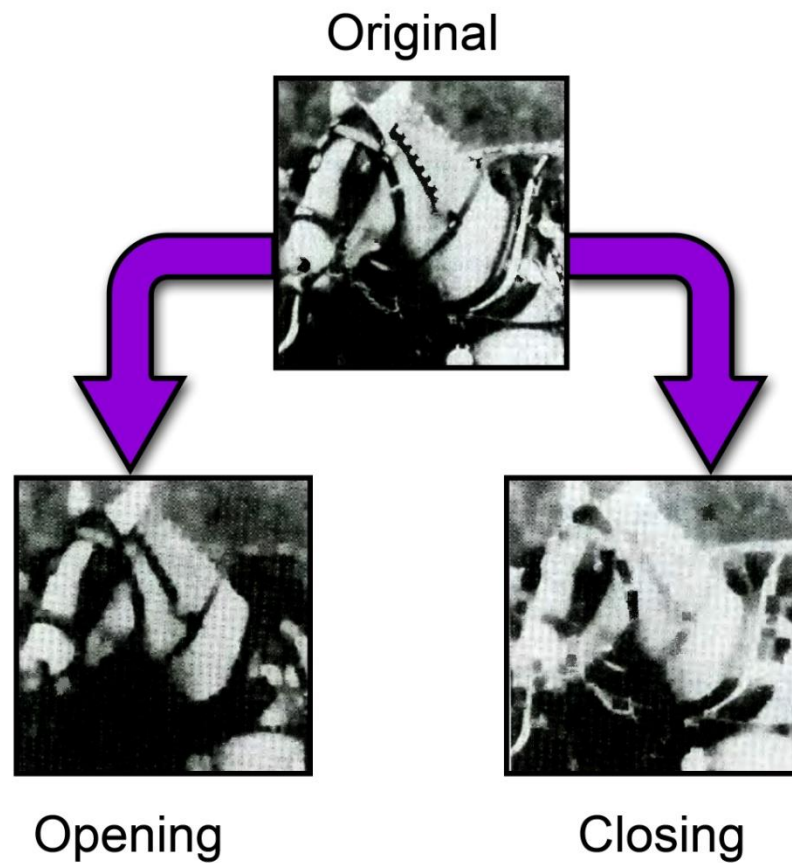
the graph according the curvature of B

•Closing a G-S picture is describable as pushing object B on top of the scan-line graph, while

traversing the graph according the curvature of B

The peaks are usually

•   remains in their

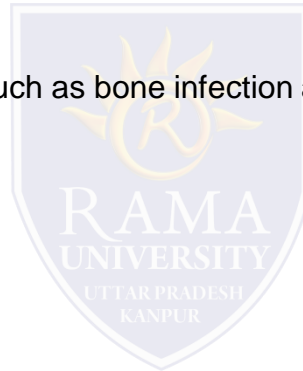•   original form

Original
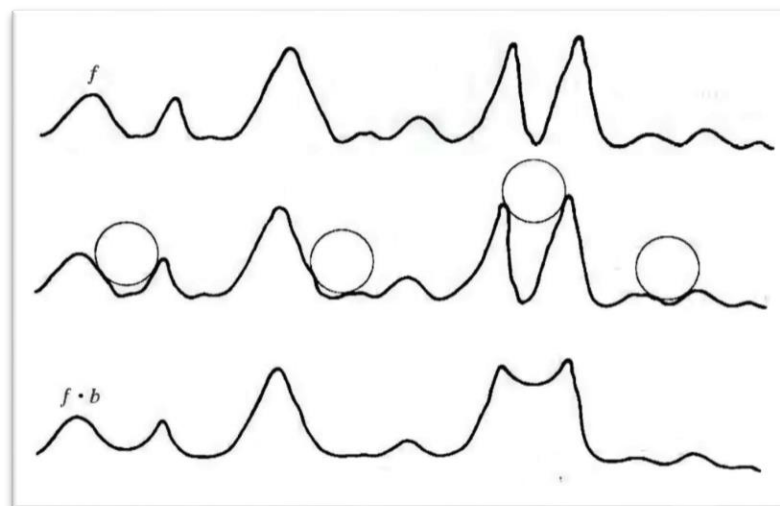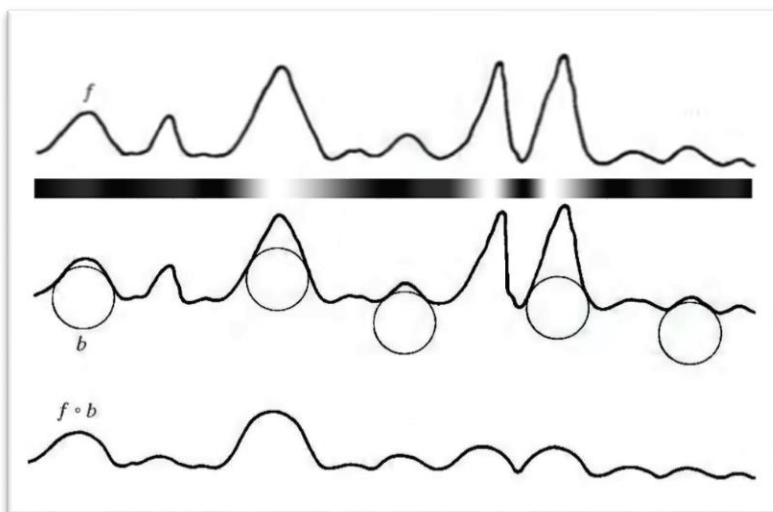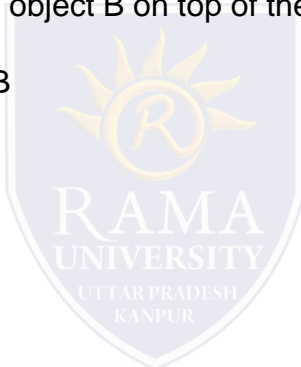
Opening

Closing

1. Which of the following fails to work on dark intensity distributions?

    a) Laplacian Transform

    b) Gaussian Transform

    c) Histogram Equalization

    d) Power-law Transformation

2. _____ is used to detect diseases such as bone infection and tumors.

    a) MRI Scan

    b) PET Scan

    c) Nuclear Whole Body Scan

    d) X-Ray

3. How do you bring out more of the skeletal detail from a Nuclear Whole Body Bone Scan?

    a) Sharpening

    b) Enhancing

    c) Transformation

    d) None of the mentioned

4. An alternate approach to median filtering is _____

    a) Use a mask

    b) Gaussian filter

    c) Sharpening

    d) Laplacian filter

5. Final step of enhancement lies in _____ of the sharpened image.

    a) Increase range of contrast

    b) Increase range of brightness

    c) Increase dynamic range

    d) None of the mentioned

References

- https://www.javatpoint.com/digital-image-processing-tutorial
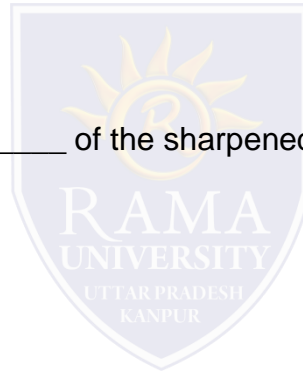
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