VIETNAM NATIONAL UNIVERSITY HO CHI MINH CITY
UNIVERSITY OF SCIENCE
COMPUTER VISION

APPLIED DIGITAL IMAGE & VIDEO PROCESSING

PRACTICE#1 REPORT

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Contents

1 Binary image

1.1 Dilation

1.1.1 Idea

$$X \oplus B = \{p \in \varepsilon^2 : p = x + b, x \in X, b \in B\}$$

Where:

- X: binary image
- B: structure matrix

1.1.2 Result

??[1]

1.2 Erosion

1.2.1 Idea

$$X \ominus B = \{p \in \varepsilon^2 : p + b \in X, \forall b \in B\}$$

Where:

- X: binary image
- B: structure matrix

[1]Convention: in result section, image from left to right: Original image, Morphology by OpenCV, Morphology by self-code

1.2.2 Result

1.3 Opening

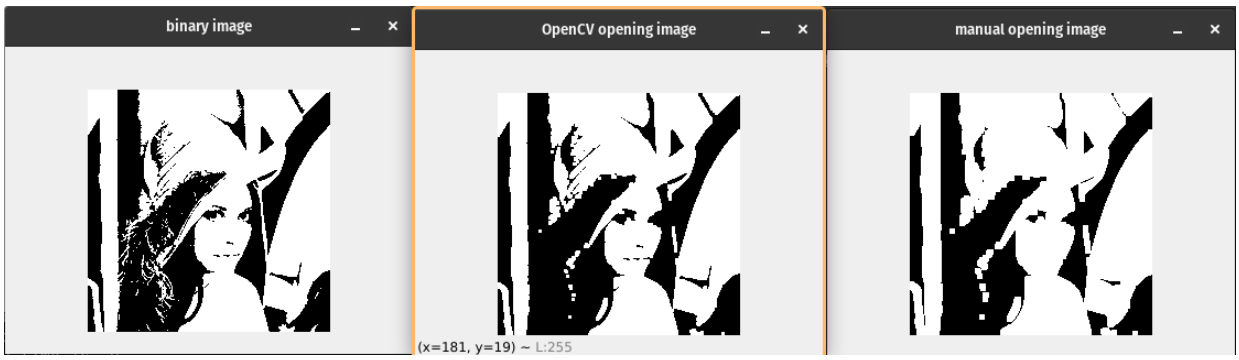
1.3.1 Idea

$$X \circ B = (X \ominus B) \oplus B$$

Where:

- X: binary image
- B: structure matrix

1.3.2 Result



1.4 Closing

1.4.1 Idea

$$X \bullet B = (X \oplus B) \ominus B$$

Where:

- X: binary image
- B: structure matrix

1.4.2 Result

1.5 Hit or miss

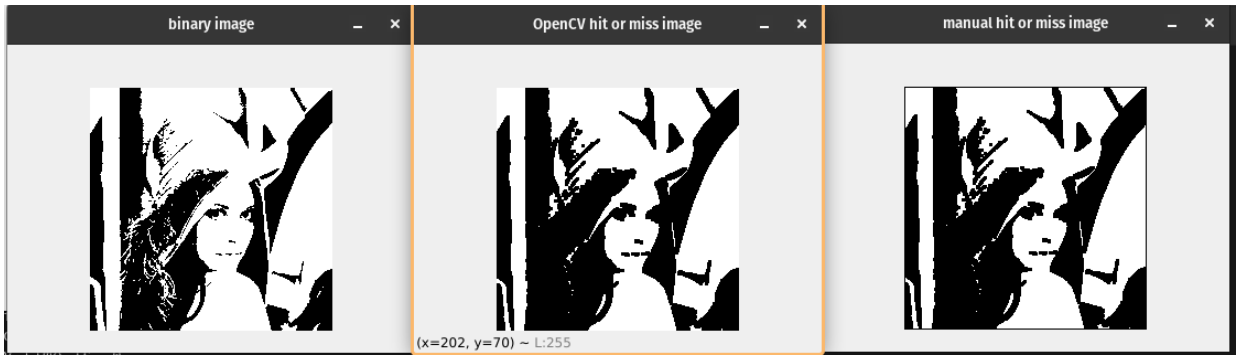
1.5.1 Idea

$$X \otimes B = (X \ominus B_1) \cap (X^c \ominus B_2)$$

Where:

- X: binary image
- B_1, B_2: structure matrix
- $B_2 = B_1^c$

1.5.2 Result



1.6 Boundary extraction

1.6.1 Idea

$$\beta(X) = X - (X \ominus B)$$

Where:

- X: binary image
- B: structure matrix

1.6.2 Result

1.7 Thinning

1.7.1 Idea

$$X \oslash B = X - (X \otimes B)$$

Where:

- X: binary image
- B: structure matrix

1.7.2 Result

1.8 Grayscale image

1.9 Dilation

1.9.1 Idea

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

Where:

- $f(x,y)$: gray-scale image
- $b(x,y)$: structuring element

1.9.2 Result

1.10 Erosion

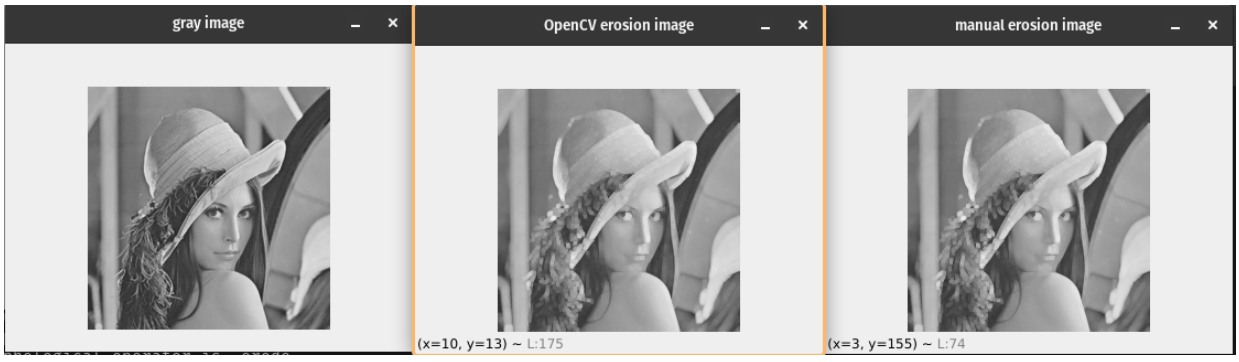
1.10.1 Idea

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

Where:

- $f(x,y)$: gray-scale image
- $b(x,y)$: structuring element

1.10.2 Result



1.11 Opening

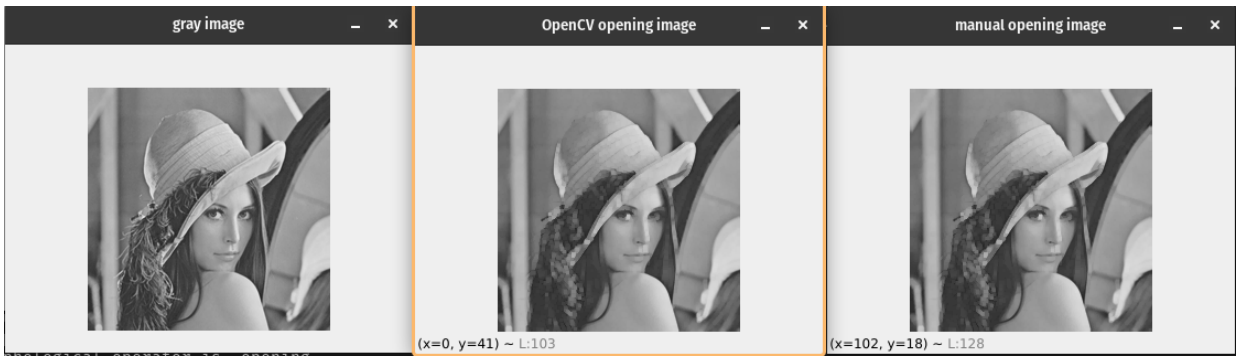
1.11.1 Idea

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

Where:

- $f(x,y)$: gray-scale image
- $b(x,y)$: structuring element

1.11.2 Result



1.12 Closing

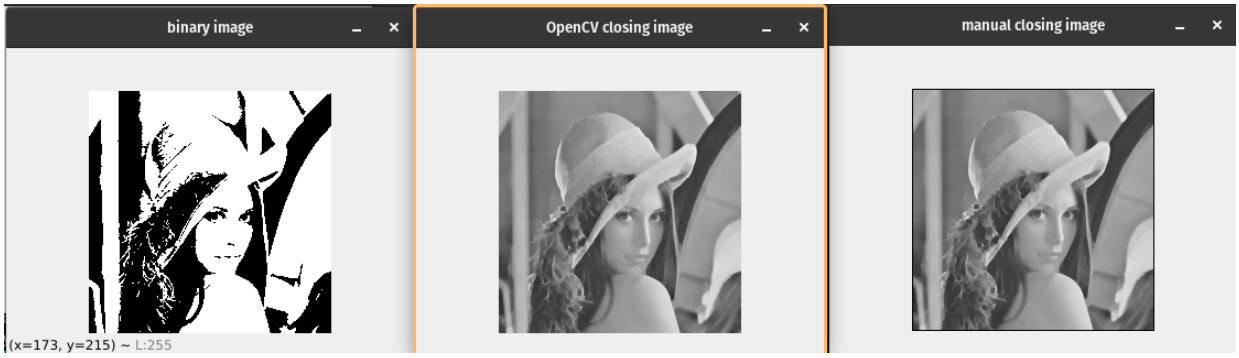
1.12.1 Idea

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

Where:

- $f(x, y)$: gray-scale image
- $b(x, y)$: structuring element

1.12.2 Result



1.13 Gradient

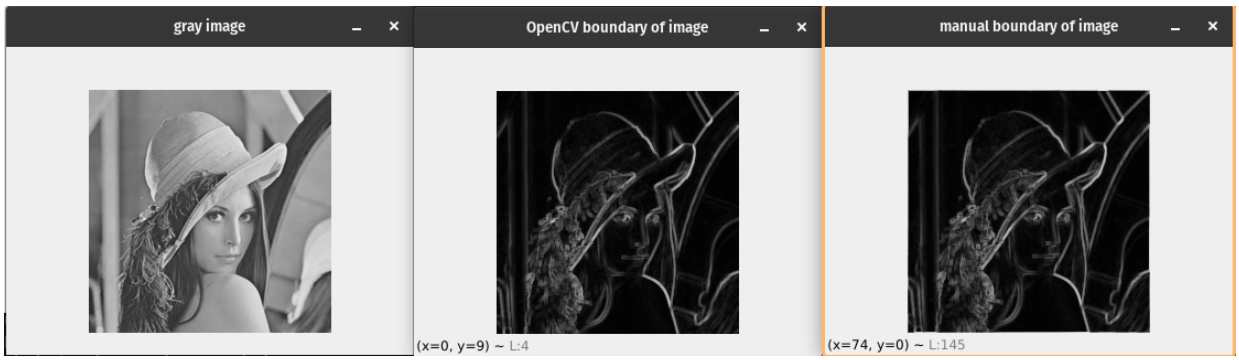
1.13.1 Idea

$$h = (f \oplus b) - (f \ominus b)$$

Where:

- $f(x, y)$: gray-scale image
- $b(x, y)$: structuring element

1.13.2 Result



1.14 Top Hat

1.14.1 Idea

$$h = f - (f \circ b)$$

Where:

- $f(x, y)$: gray-scale image
- $b(x, y)$: structuring element

1.14.2 Result

1.15 Black Hat

1.15.1 Idea

$$h = (f \bullet b) - f$$

Where:

- $f(x, y)$: gray-scale image
- $b(x, y)$: structuring element

1.15.2 Result

2 Self-scoring table

No.	Type	Morphology	Percent	Note
1	Binary image	Dilation	100%	
2		Erosion	100%	
3		Opening	100%	
4		Closing	100%	
5		Hit or miss	100%	
6		Boundary extraction	100%	
7		Thinning	100%	
8	Grayscale image	Dilation	100%	
9		Erosion	100%	
10		Opening	100%	
11		Closing	100%	
12		Boundary extraction	100%	
13		Top-hat	100%	
14		Black-hat	100%	