

Στοιχεία ψηφιακής επεξεργασίας εικόνας

Θεωρία συνόλων
Μορφολογικό φιλτράρισμα

Θεωρία συνόλων

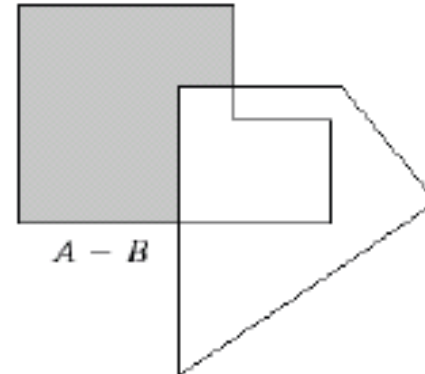
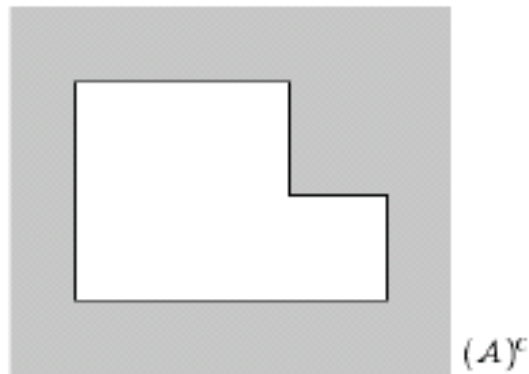
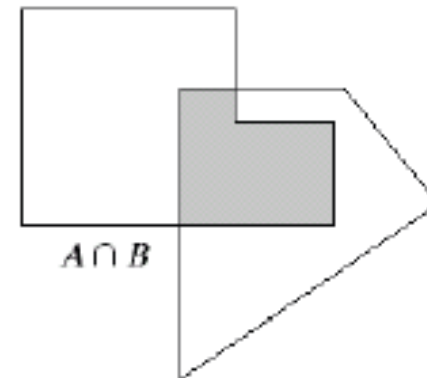
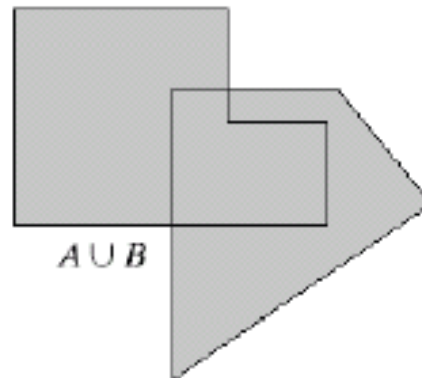
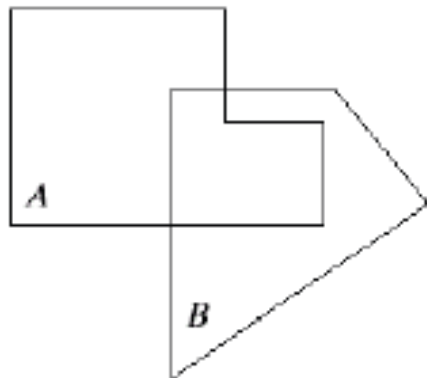
$$A \subseteq B$$

$$C = A \cup B$$

$$D = A \cap B$$

$$A^c = \{w \mid w \notin A\}$$

$$A - B = \{w \mid w \in A, w \notin B\} = A \cap B^c$$



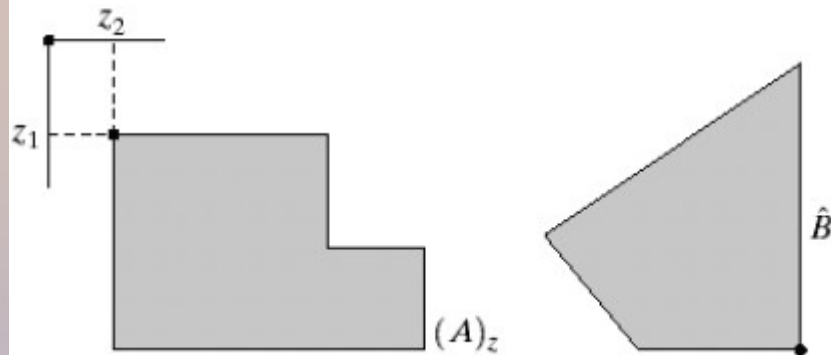
Θεωρία συνόλων

Ανάκλαση - Reflection

$$\hat{B} = \{w \mid w = -b, \text{ for } b \in B\}$$

Μετατόπιση -
Translation

$$(A)_z = \{c \mid c = a + z, \text{ for } a \in A\}$$



Dilation

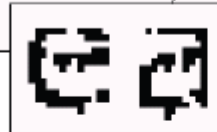
$$\begin{aligned} A \oplus B &= \{x \mid (\hat{B})_x \cap A \neq \phi\} \\ &= \{x \mid [(B)_x \cap A] \subseteq A\} \end{aligned}$$

A: Εικόνα

B: Δομικό στοιχείο

Η επεξεργασία μοιάζει με δυαδική συνέλιξη

Historically, certain computer programs were written using only two digits rather than four to define the applicable year. Accordingly, the company's software may recognize a date using "00" as 1900 rather than the year 2000.

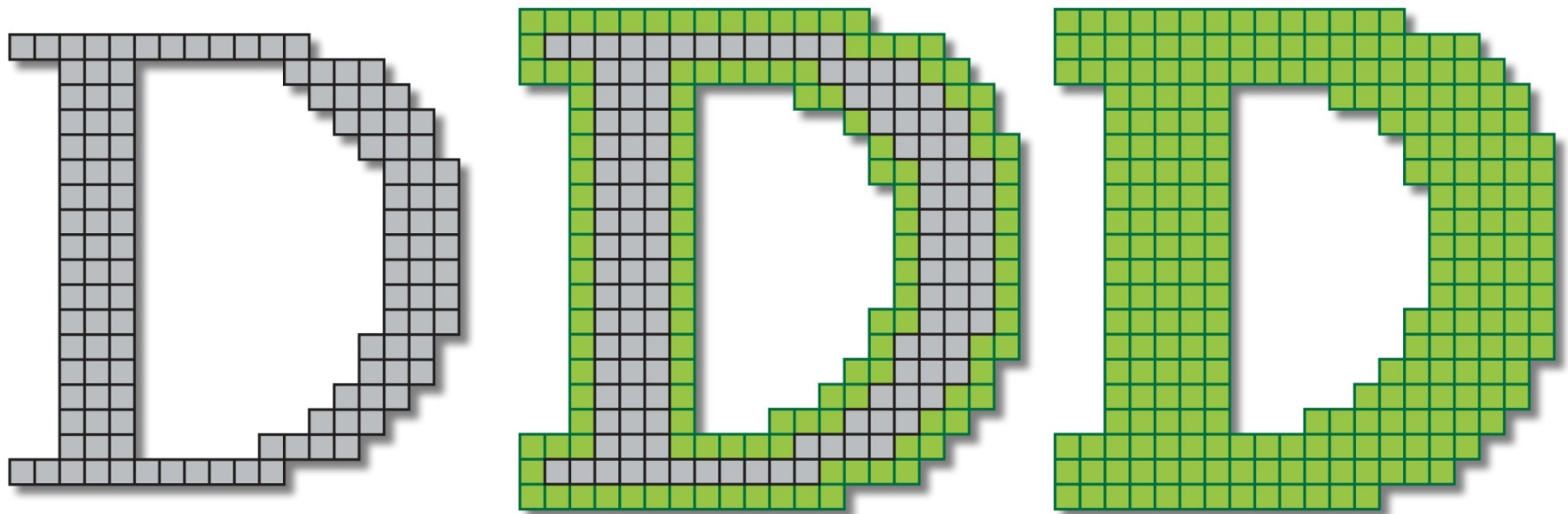


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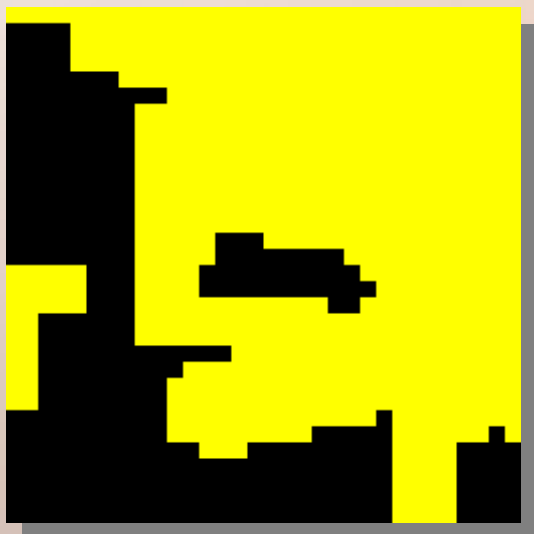


0	1	0
1	1	1
0	1	0

Dilation



Dilation

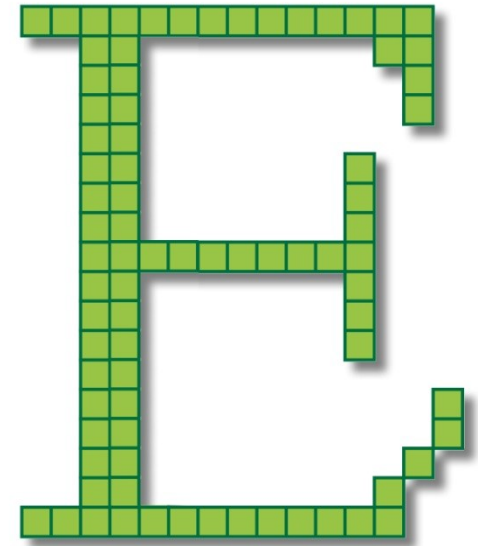
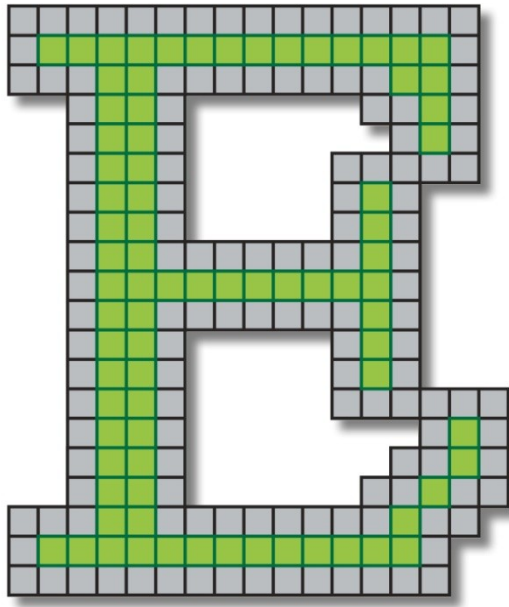
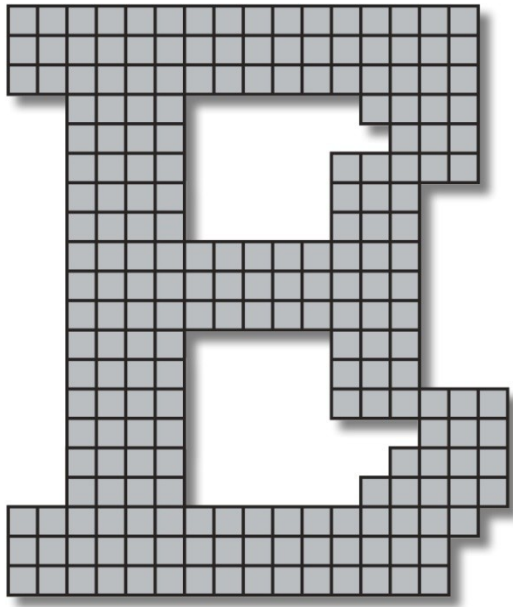


Erosion

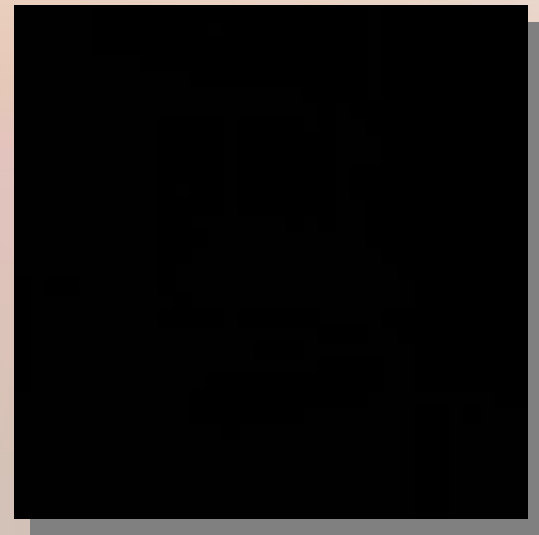
$$A \ominus B = \{x \mid (B)_x \subseteq A\}$$

Αφαιρεί πληροφορία -> «λεπταίνει» σχήματα

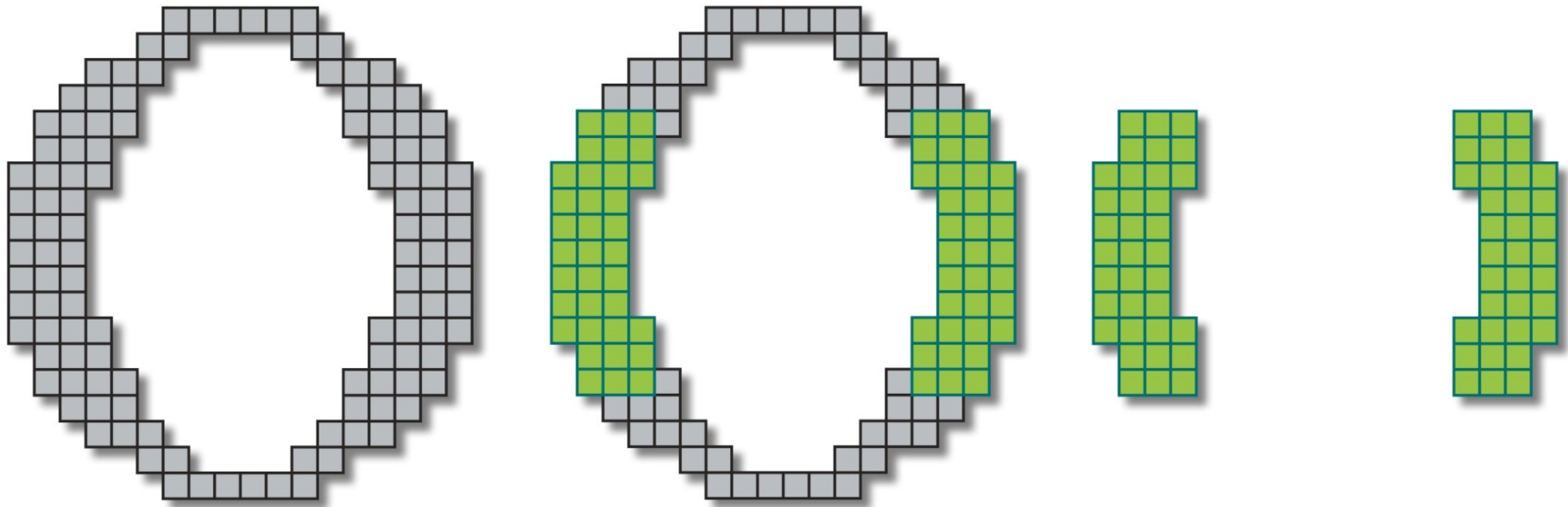
Erosion



Erosion



Opening: Erosion->dilation



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

Ομαλοποιεί τις ακμές
Διαγράφει μικρές τρύπες
Συμπληρώνει ατέλειες στα όρια μεγάλων περιοχών
Διαγράφει λεπτές γραμμές

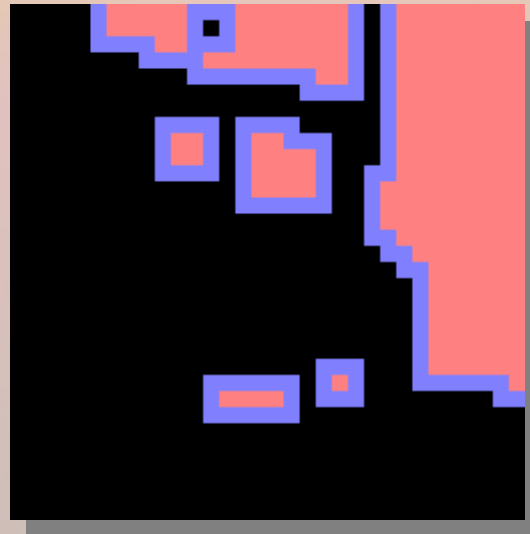
Opening: Erosion->dilation

erode the original



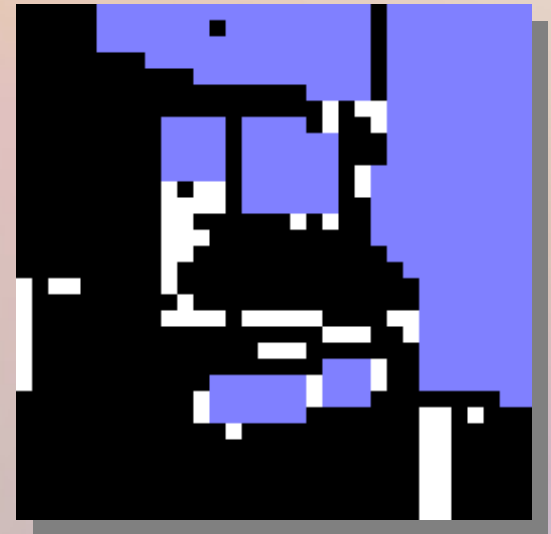
erosion / original

dilate the erosion



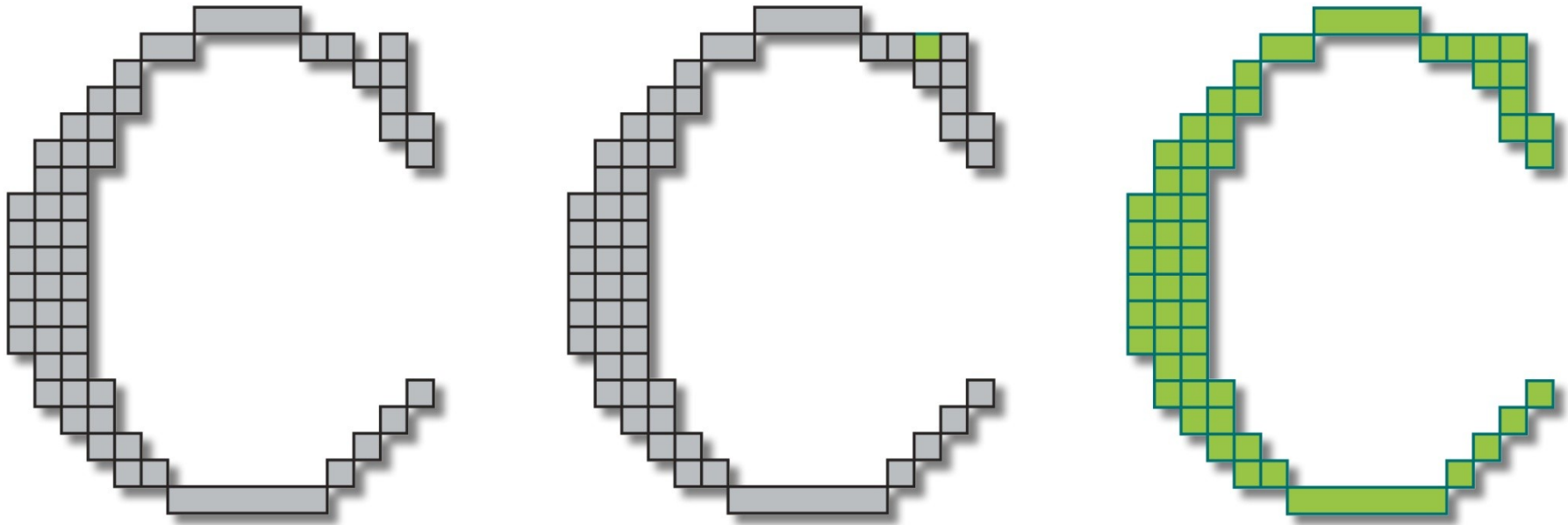
erosion / opening

dilated erosion



opening / original

Closing: Dilation->Erosion



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

Ομαλοποιεί τις ακμές
Διαγράφει μικρές τρύπες
Διατηρεί λεπτές γραμμές

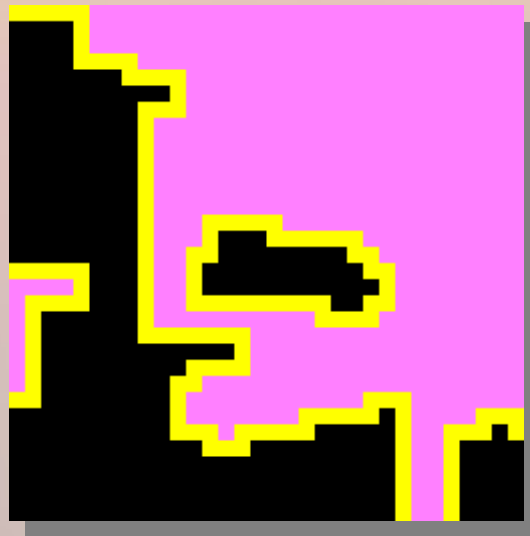
Closing: Dilation->Erosion

original image



original / dilation

erode the dilation



closing / dilation

to get the closing



closing / original

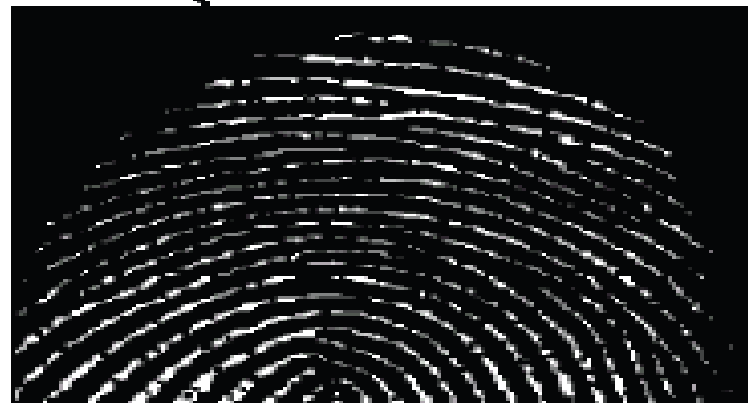
Opening + Closing



A
 $A \ominus B$

B

1	1	1
1	1	1
1	1	1



$(A \ominus B) \oplus B = A \cdot B$
 $(A \cdot B) \oplus B$ $[(A \cdot B) \oplus B] \ominus B = (A \cdot B) \cdot B$

