Analyse d'images

– Morphologie mathématique –

Bibliographie

Ouvrages :

→ *Digital Image Processing, 3rd Ed., chapter 9 "Morphological Image processing"*, Rafael C. Gonzalez and Richard E. Woods, Prentice Hall, 2008.

Cours :

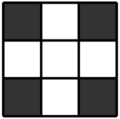
→ Vincent Mazet, cours "Outils fondamentaux pour le traitement d'image", *http ://miv.u-strasbg.fr/mazet/ofti*

→ Vincent Noblet, cours "Traitement d'images" TICS2A, *http ://icube-miv.unistra.fr/fr/index.php/Traitement_d'images_TICS2A*

Plan du chapitre

Dilatation

E =



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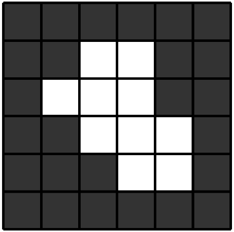

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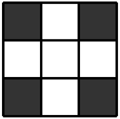
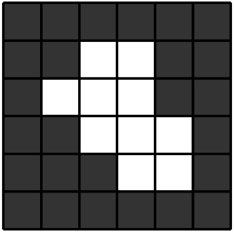
E = 

I = 

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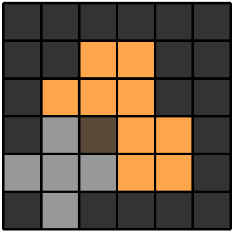
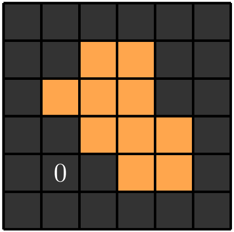


$\mathrm{I} \oplus \mathrm{E} =$ 

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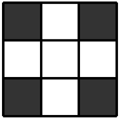
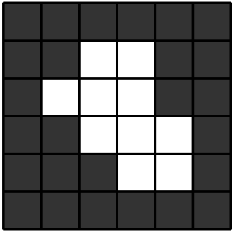
E = 

I = 

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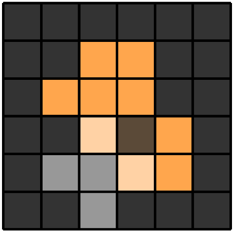
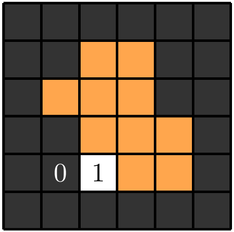


$\mathrm{I} \oplus \mathrm{E} =$ 

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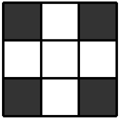
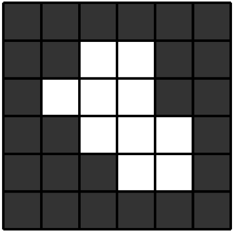
E = 

I = 

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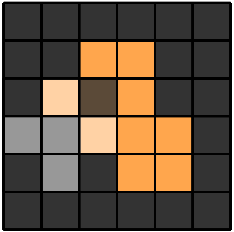

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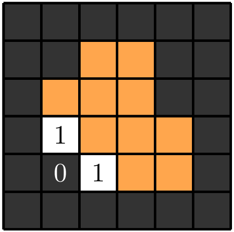

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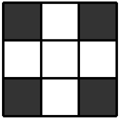
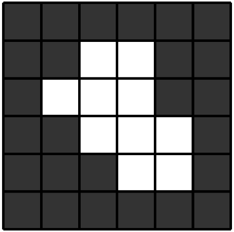
E = 

I = 

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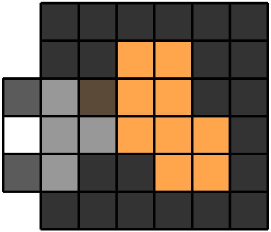

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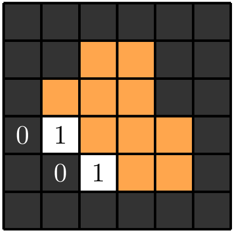

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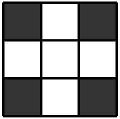

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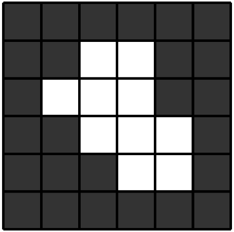

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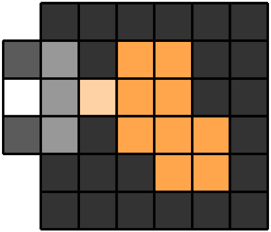

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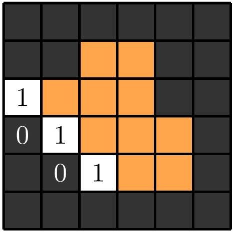

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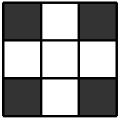
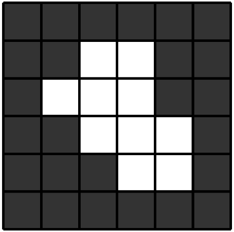
E = 

I = 

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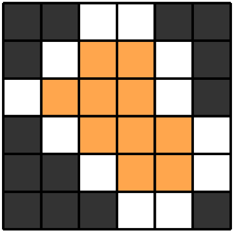
Résultat de la dilatation

$\mathrm{I} \oplus \mathrm{E} =$ 

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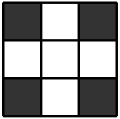
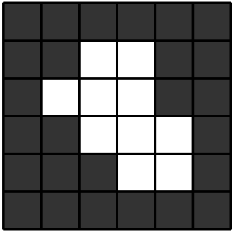
E = 

I = 

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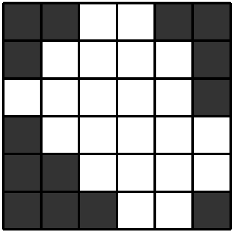
$\mathrm{I} \oplus \mathrm{E} =$ 

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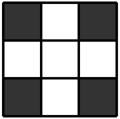
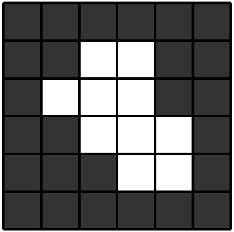
E = 

I = 

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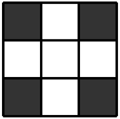
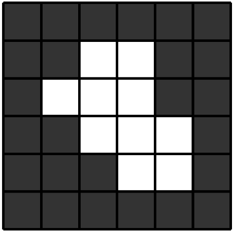
E = 

I = 

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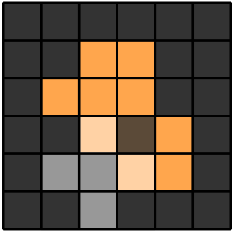
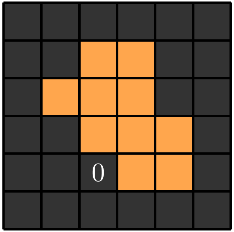


$\mathrm{I} \ominus \mathrm{E} =$ 

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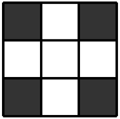
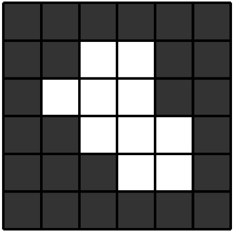
E = 

I = 

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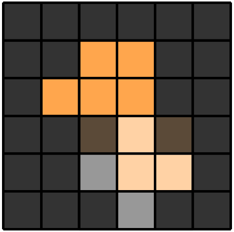
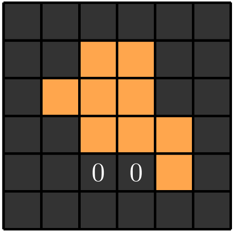


$\mathrm{I} \ominus \mathrm{E} =$ 

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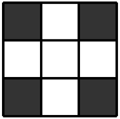
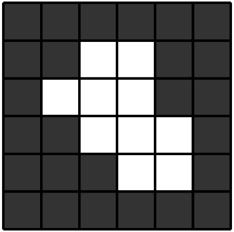
E = 

I = 

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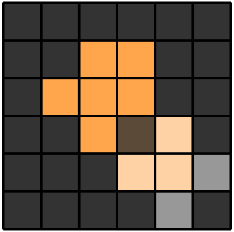
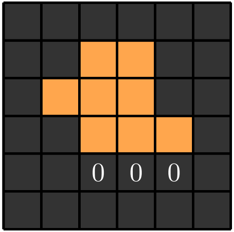


$\mathrm{I} \ominus \mathrm{E} =$ 

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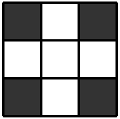
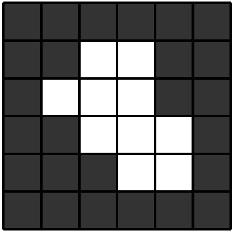
E = 

I = 

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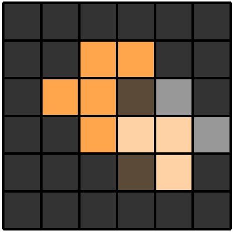

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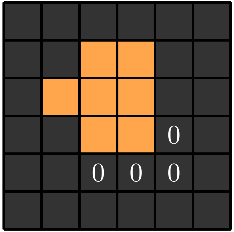

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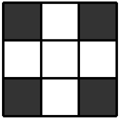
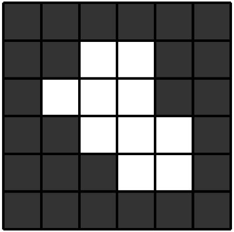
E = 

I = 

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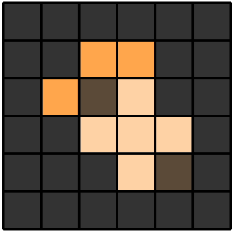
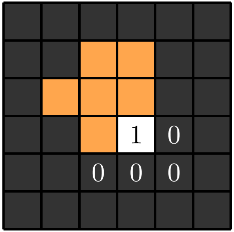


$\mathrm{I} \ominus \mathrm{E} =$ 

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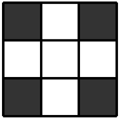
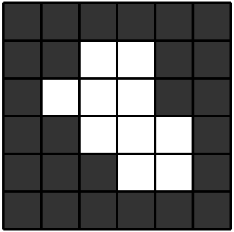
E = 

I = 

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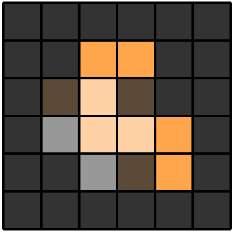

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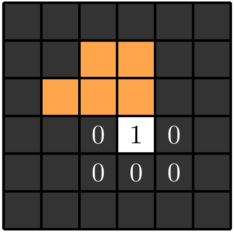

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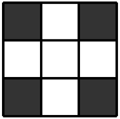
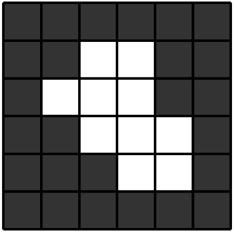
E = 

I = 

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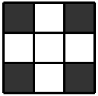
Résultat final : $I \ominus E =$

		0	0		
	0	1	0		
		0	1	0	
		0	0	0	

Propriétés mathématiques : $\bar{I} \ominus E = \overline{I \oplus E}$

$E =$



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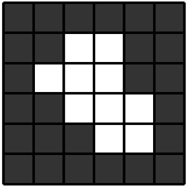

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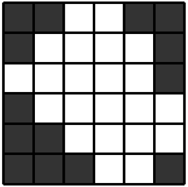

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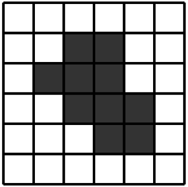

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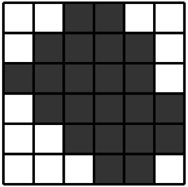

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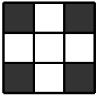

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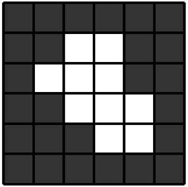
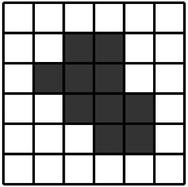
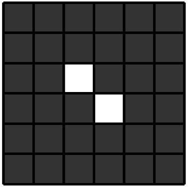


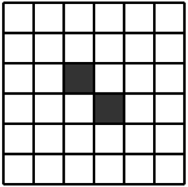
$\bar{I}$ =



$I \ominus E$ =



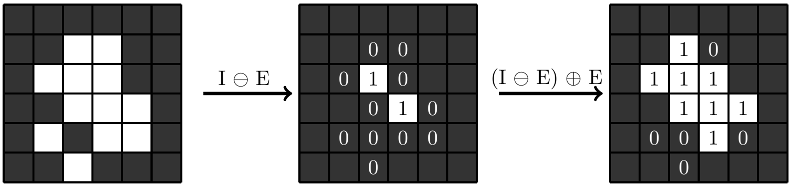
$\bar{I} \oplus E$ =



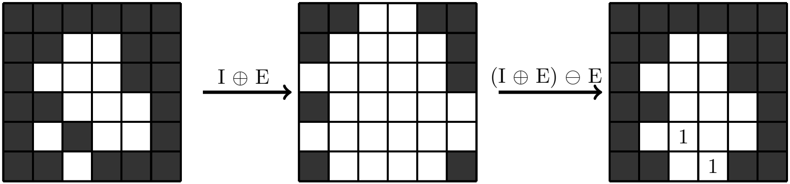
$\bar{I} \oplus E = \overline{I \ominus E}$

Plan du chapitre

Ouverture



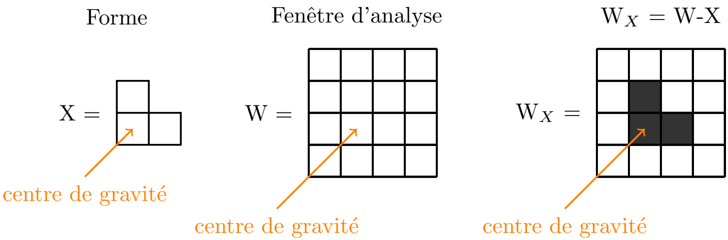
Fermeture



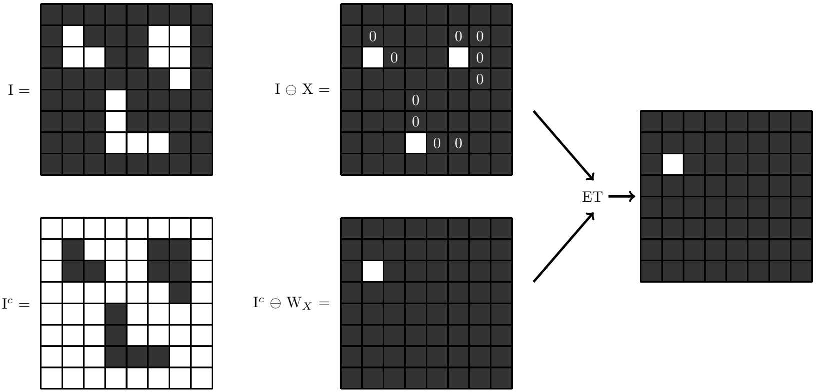
Plan du chapitre

Tout-ou-rien

Objectif : Détecter la/les position(s) des objets qui ont *exactement* la même forme que X dans une image.



Tout-ou-rien

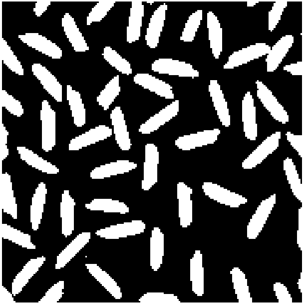


Plan du chapitre

Détection de contour

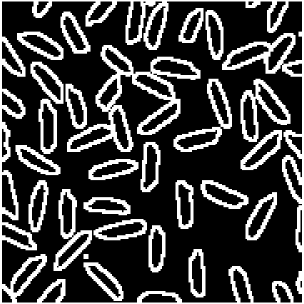
Image seuillée

$I =$



Détection des contours

$I - (I \ominus E) =$



$$E = \begin{array}{|c|c|c|} \hline 1 & 1 & 1 \\ \hline 1 & 1 & 1 \\ \hline 1 & 1 & 1 \\ \hline \end{array}$$

Remplissage de région – algorithme

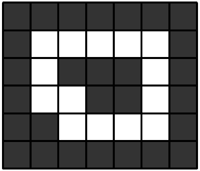
Initialisation :

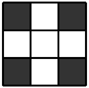
- → On se donne une image binaire I et un élément structurant E (par exemple un 4-voisinage ou un 8-voisinage).
- → Créer une image vierge X_0 de la même taille que l'image I.
- → Sélectionner un pixel à l'intérieur de chaque chemin fermé à remplir et mettre la valeur de ce pixel à 1 dans X_0.

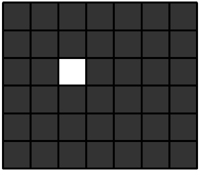
Itération k **:**

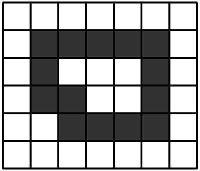
- → Dilater X_{k-1} à l'aide de E : $X_{k-1} \oplus E$.
- → Tant que $X_{k-1} \oplus E \neq X_{k-1}$: $X_k = (X_{k-1} \oplus E) \cap I^c$ (cette étape permet de ne pas dépasser le contour).
- → Sinon : stopper l'algorithme et l'image remplie est : $I \cup X_{k-1}$.

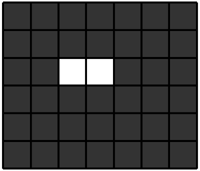
Remplissage de région – algorithme

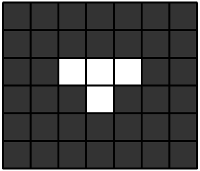
$I =$ 

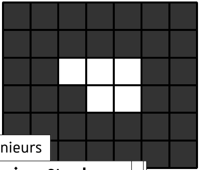
$E_8 =$ 

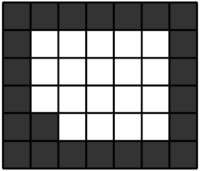
$X_0 =$ 

$I^c =$ 

$X_1 =$ 

$X_2 =$ 

$X_3 =$ 

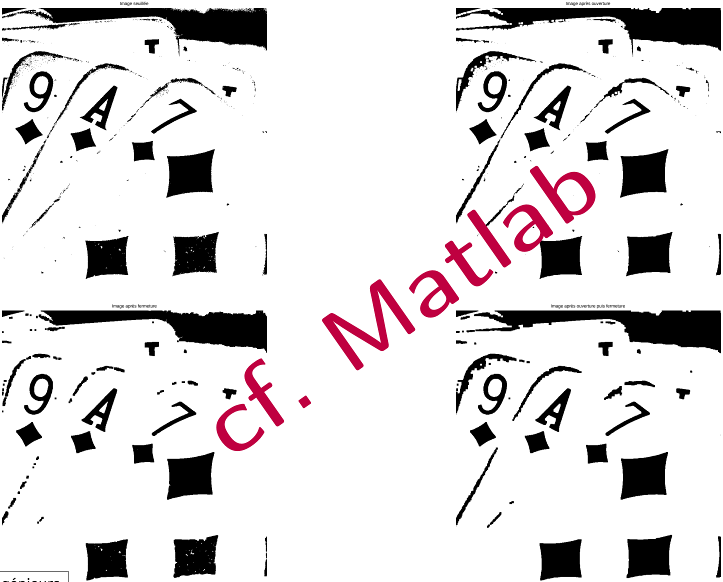
$X_4 = X_3$ donc : $I \cup X_3 =$ 

Remplissage de région

Image + centres

Résultat du remplissage

Amélioration d'image seuillée



cf. Matlab

A suivre ...

Détection de caractéristiques