SCC0251
Processamento de Imagens

Morfologia Matemática

Professora Leo Sampaio Ferraz Ribeiro

ICMC USP SÃO CARLOS

GIA graphics, imaging, visualization and analytics

Slide para não esquecer de passar a lista

Júpiter - Sistema de Gestão Acadêmica da Pró-Reitoria de Graduação

Lista de Presença

Horário	Prof(a).
qua 08:10 09:50	Leo Sampaio Ferraz Ribeiro
sex 08:10 09:50	Leo Sampaio Ferraz Ribeiro

Unidade: 55 Instituto de Ciências Matemáticas e de Computação
Disciplina: SCC0251 Processamento de Imagens
Turma: 2025101 - Teórica
Período: 24/02/2025 - 07/07/2025
Disciplina COM 2ª Avaliação.

NºUSP	Ingr.	Curso	Nome	dia __/__/___	dia __/__/___	dia __/__/___
14712657	28/02/2024	55041	Allan Vitor de Souza Silva			
13687196	11/02/2022	55071	Amabile Pietrobon Ferreira			
13687108	23/02/2022	55090	Arthur Hiratsuka Rezende			
12691964	13/03/2023	55041	Arthur Pin			
13671532	11/02/2022	55041	Arthur Queiroz Moura			
12745212	03/05/2021	97001	Asafe Henrique de Oliveira Franca			
12542481	16/04/2021	55041	Bernardo Maia Coelho			
12733212	29/04/2021	55041	Bernardo Rodrigues Tameirao Santos			
14745682	13/03/2023	55071	Bruno Batista Pereira da Silva			
13672220	25/03/2022	55041	Camila Donda Ronchi			
12542630	18/03/2021	55041	Carlos Filipe de Castro Lemos			
14746015	24/02/2025	55090	Diego Gladcheff Munhoz			
12556973	25/02/2022	55041	Eduarda Fritzen Neumann			
14568142	27/01/2023	55090	Enzo Castelo Branco Biondi			
13781841	07/03/2022	55041	Enzo Yasuo Hirano Harada			
12547423	13/03/2023	55041	Fabricio Sampaio			

Operações com Elementos Estruturais

Erosão

$$A \ominus B = \left\{ z \mid \hat{B}_z \subseteq A \right\}$$

Dilatação

$$A \oplus B = \{ z \mid \hat{B}_z \cap A \neq \varnothing \}$$

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

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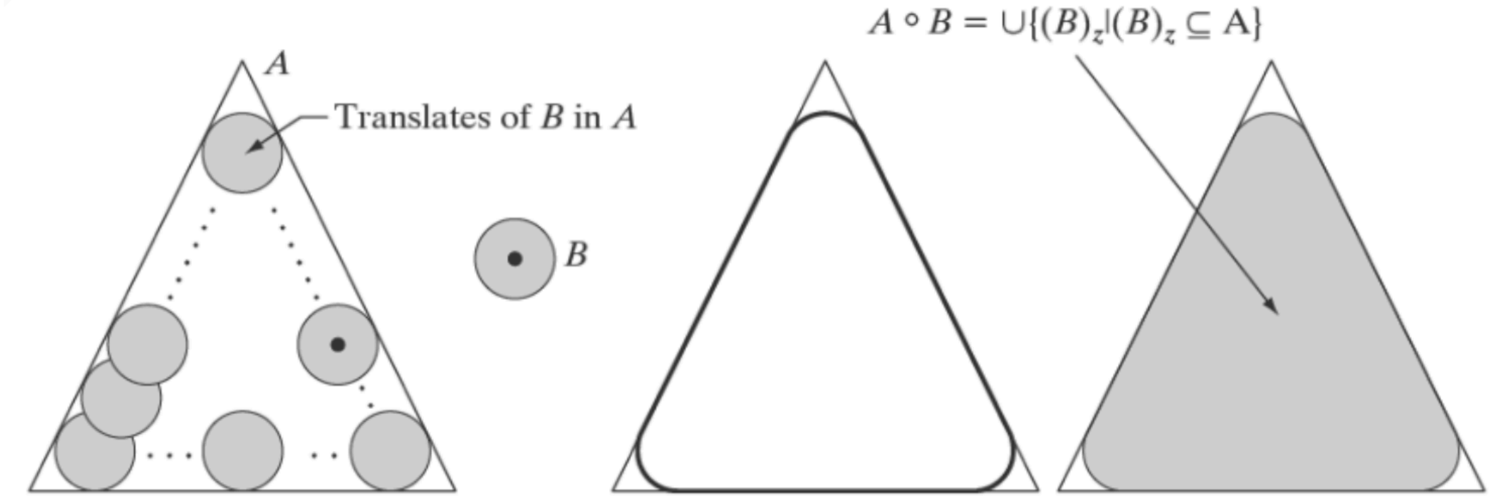

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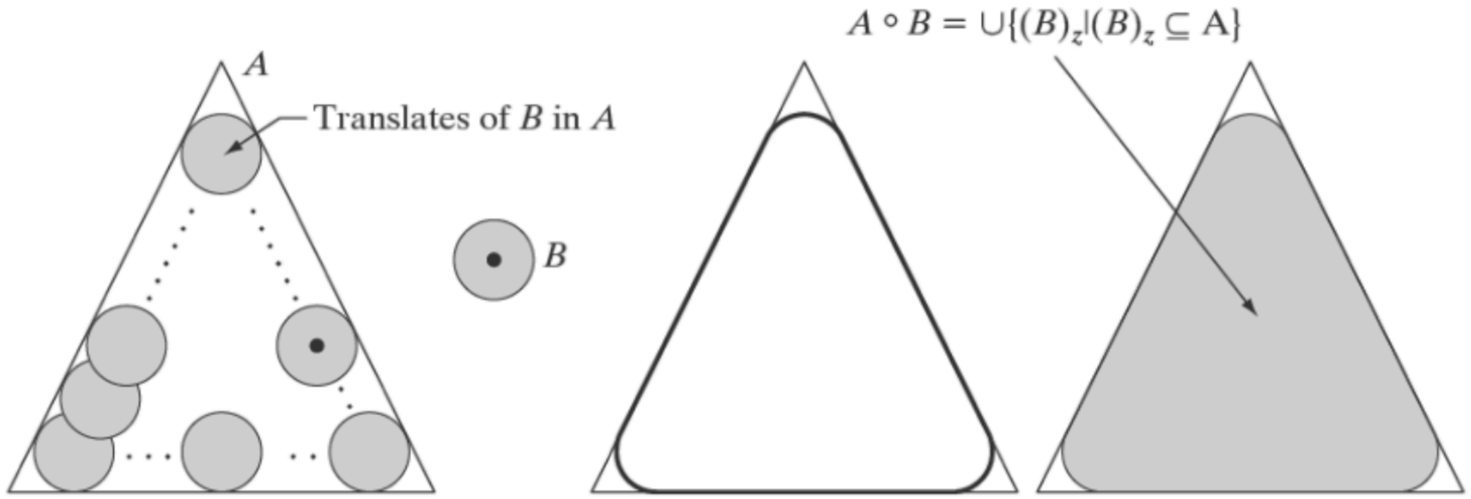

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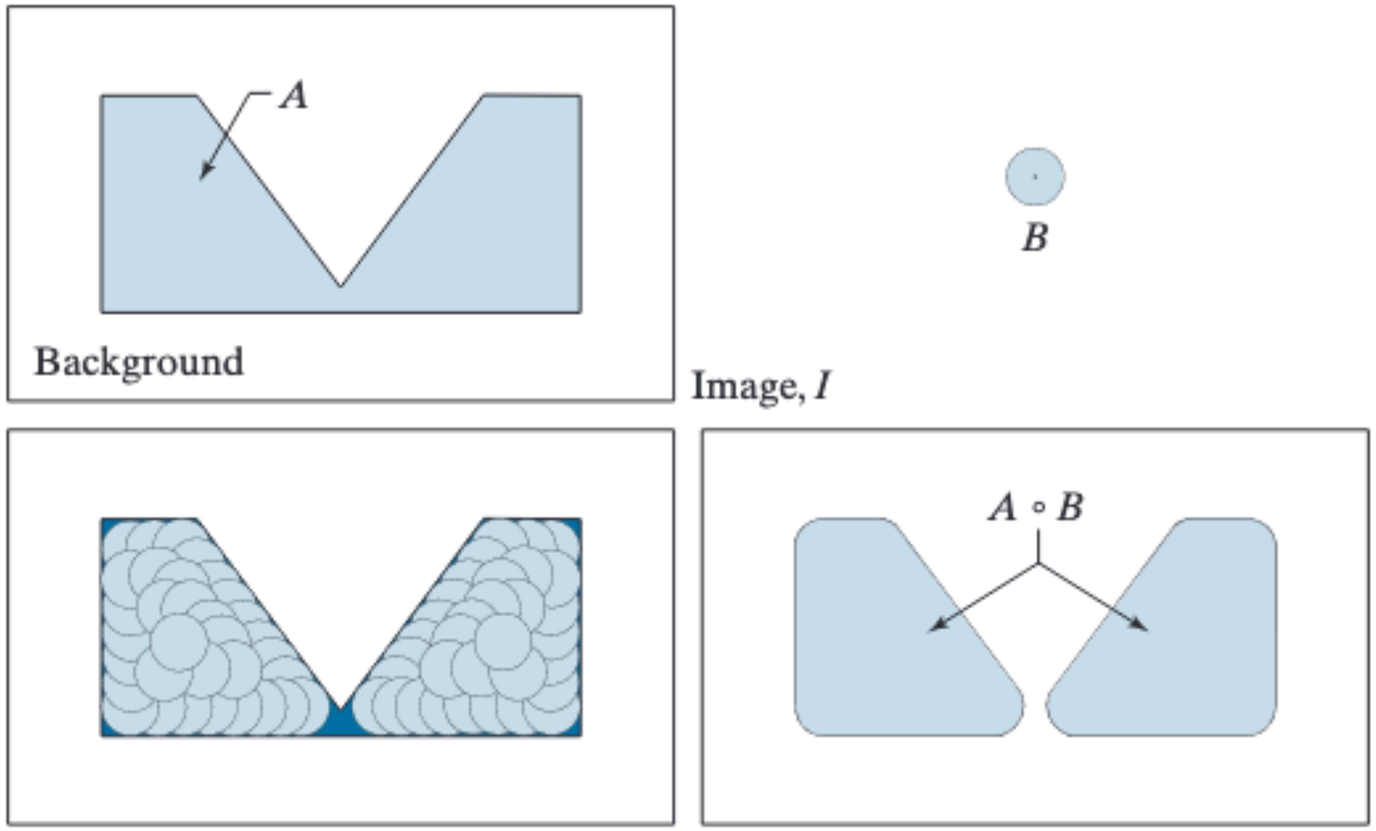

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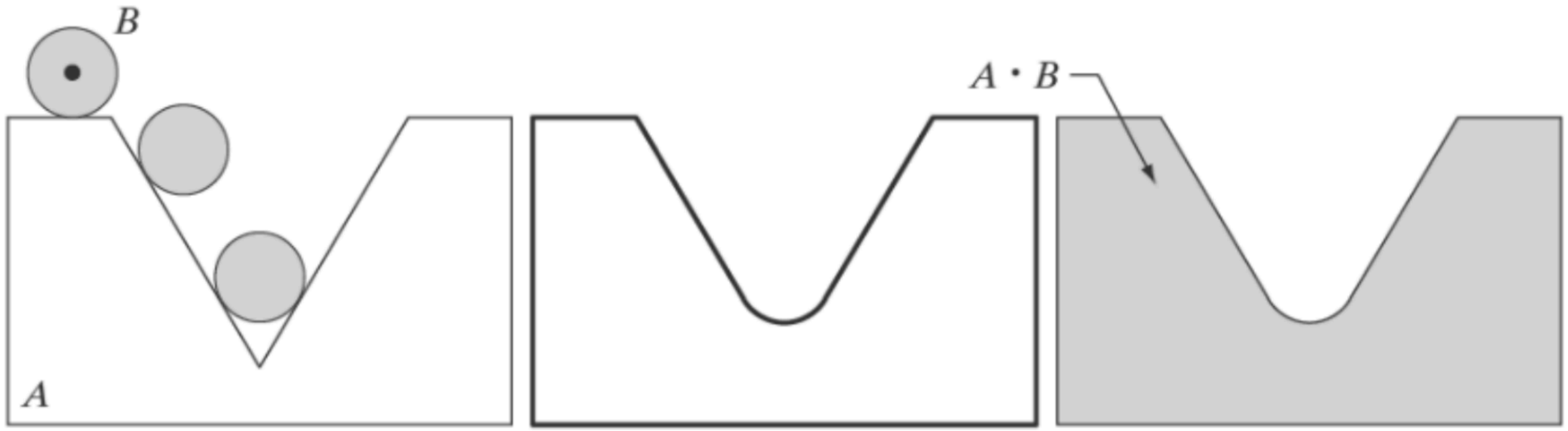

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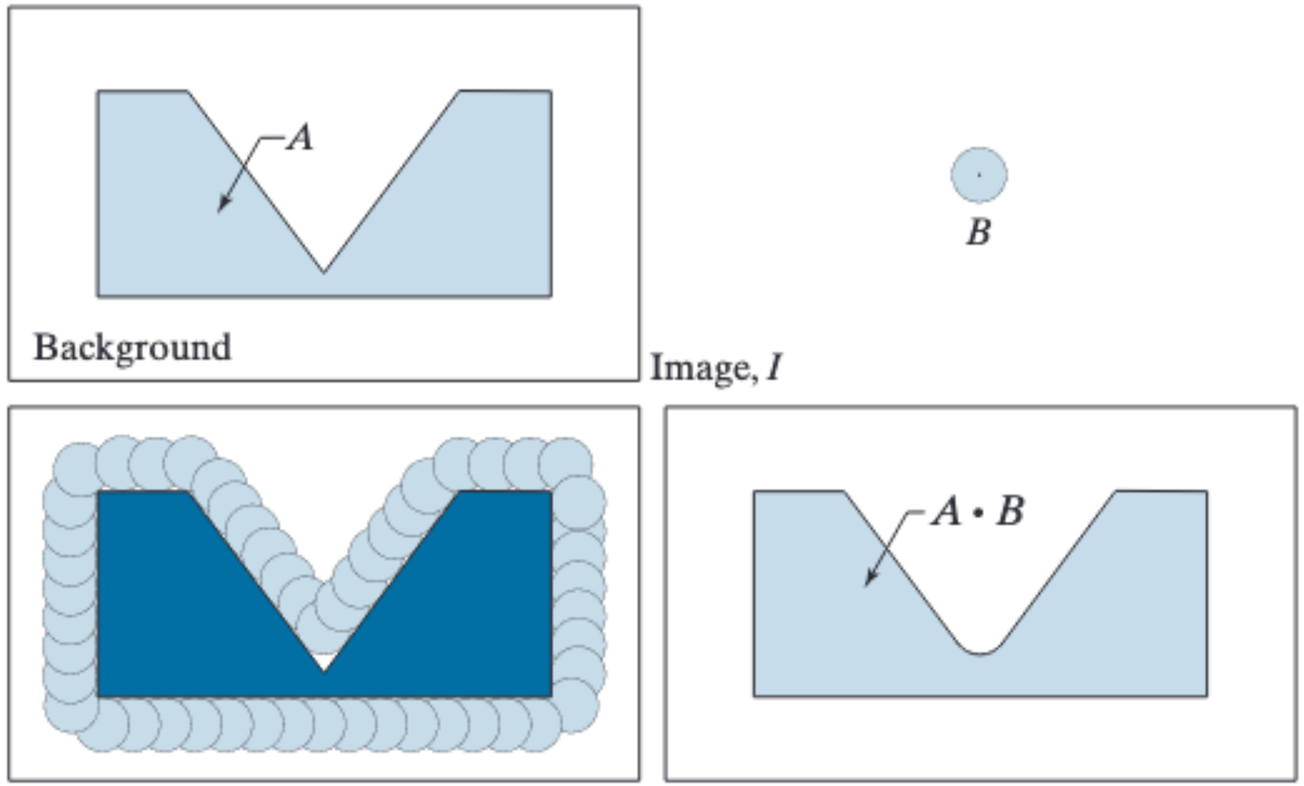

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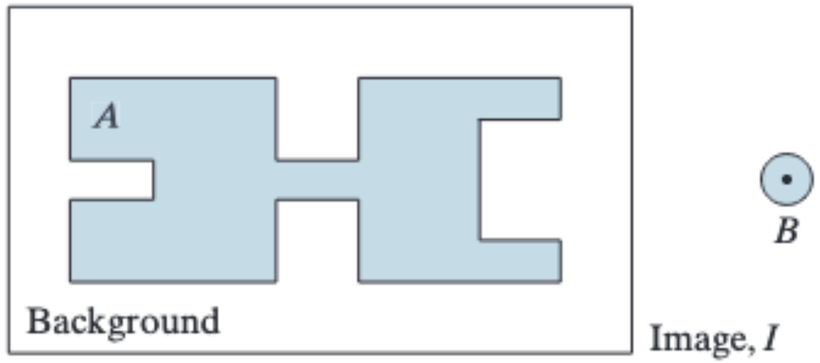

Image, I

Operações com Elementos Estruturais

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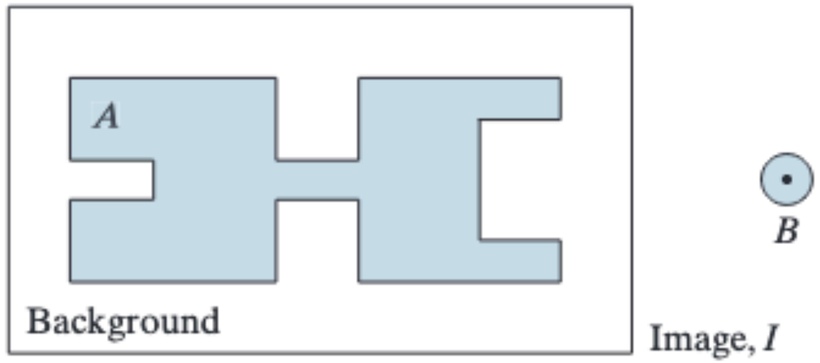

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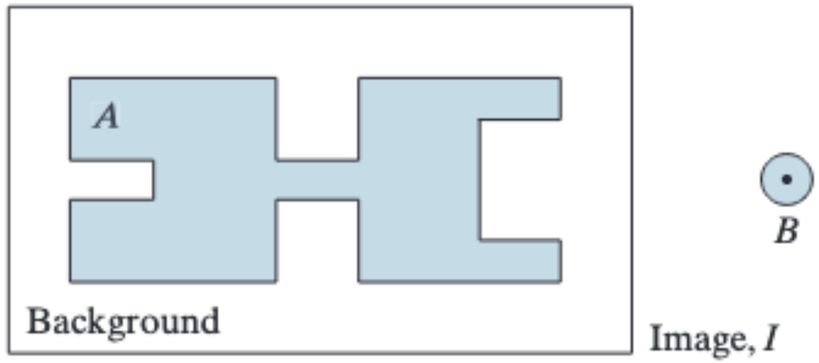
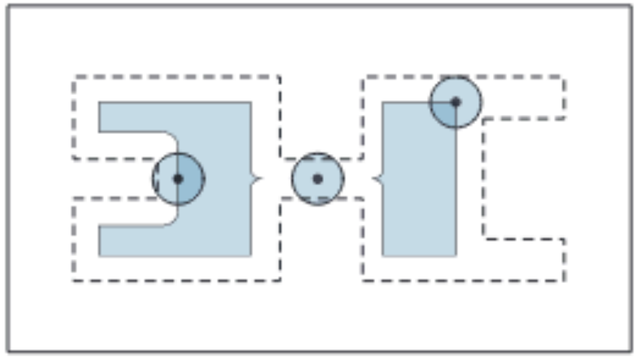


Image, I



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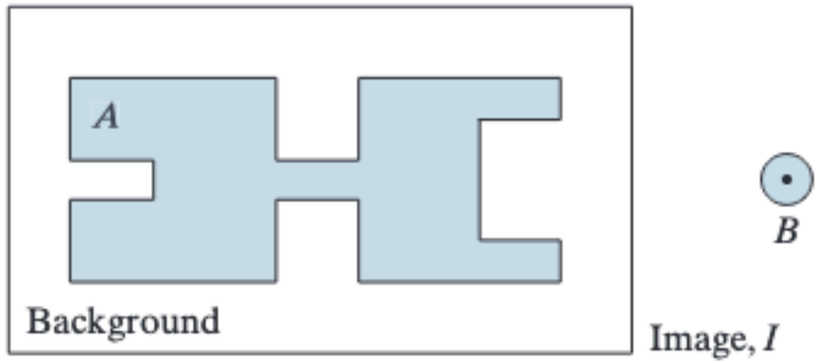

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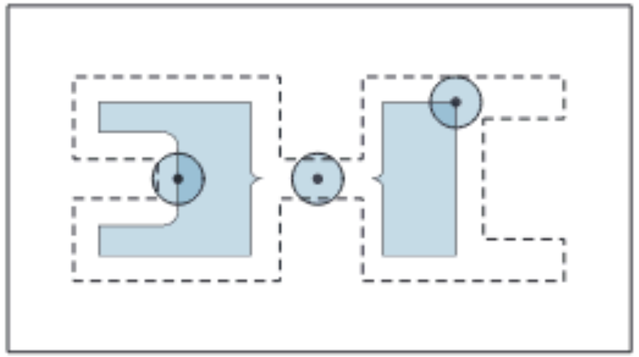

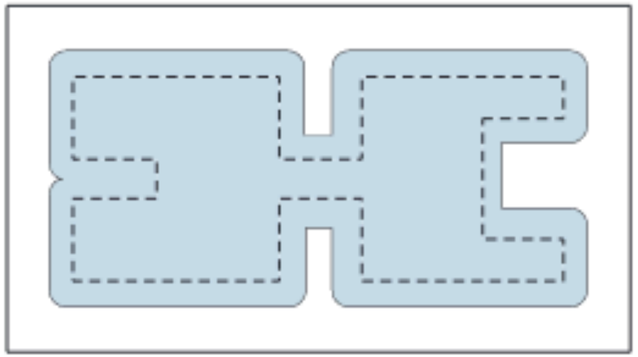

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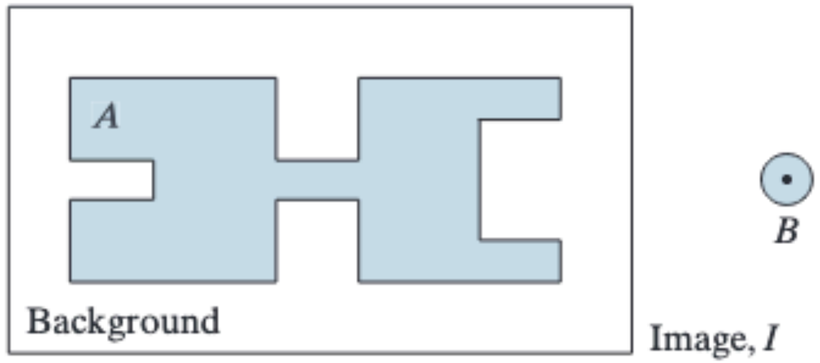

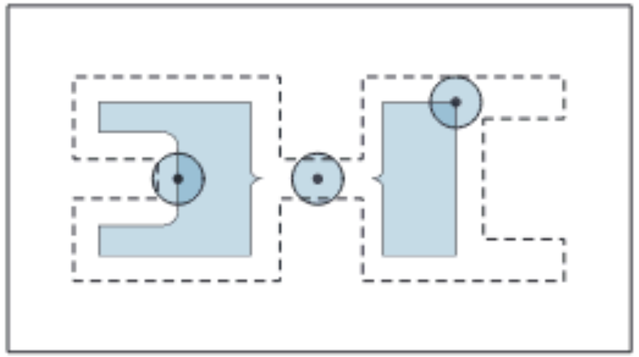

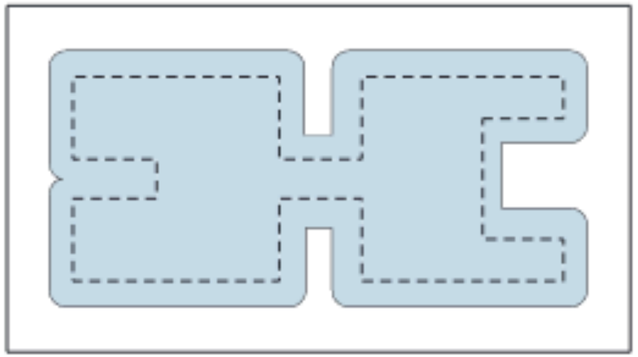

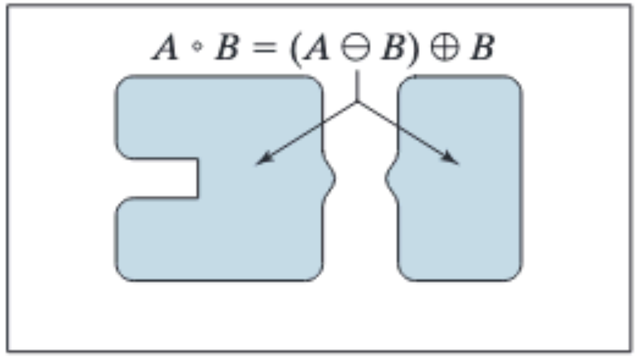

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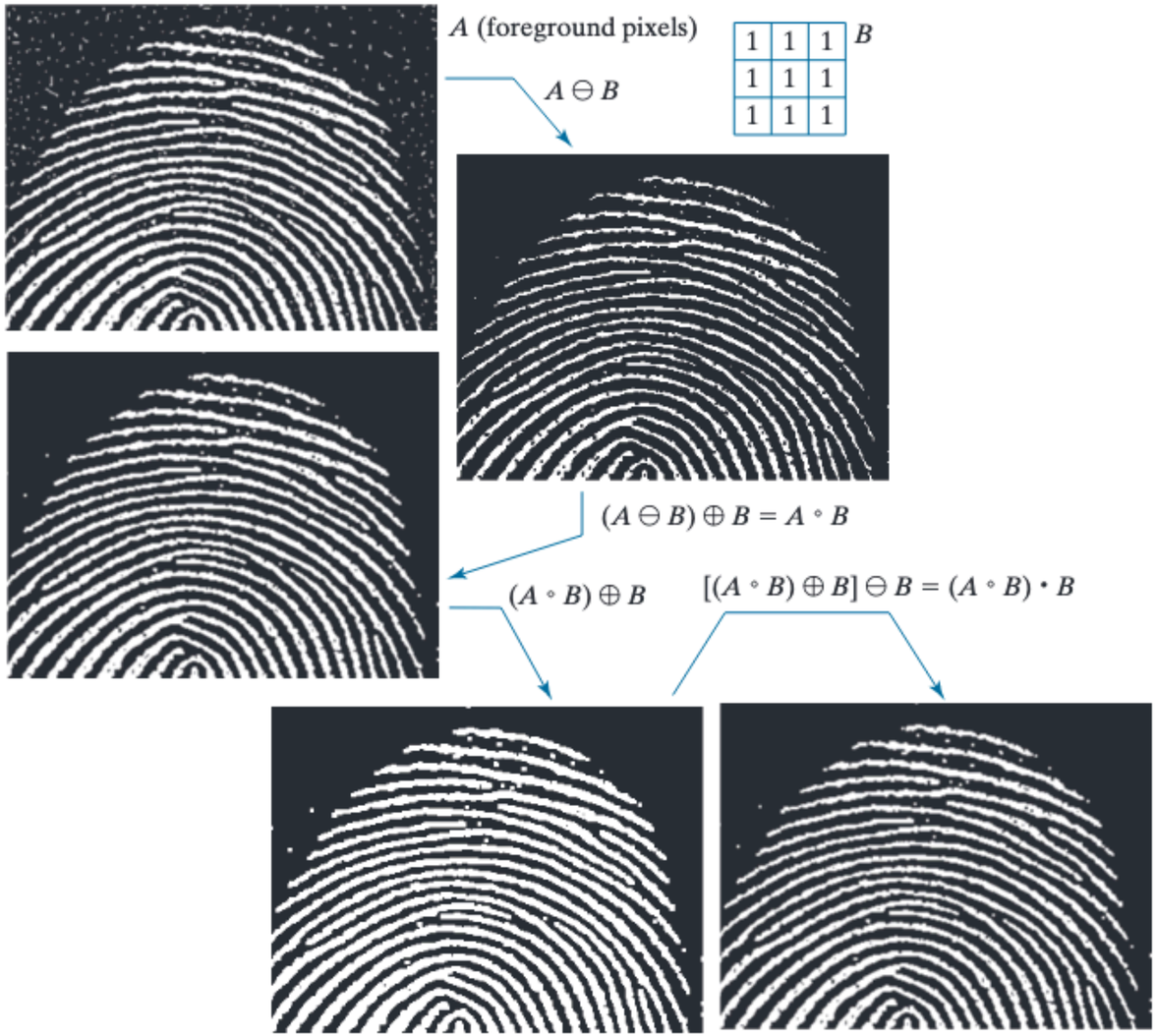

Transformada Hit-or-Miss

$$A \odot B = (A \ominus B_1) \cap (A^c \ominus B_2) \qquad A \odot B = (A \ominus B_1) - (A \oplus \hat{B}_2)$$

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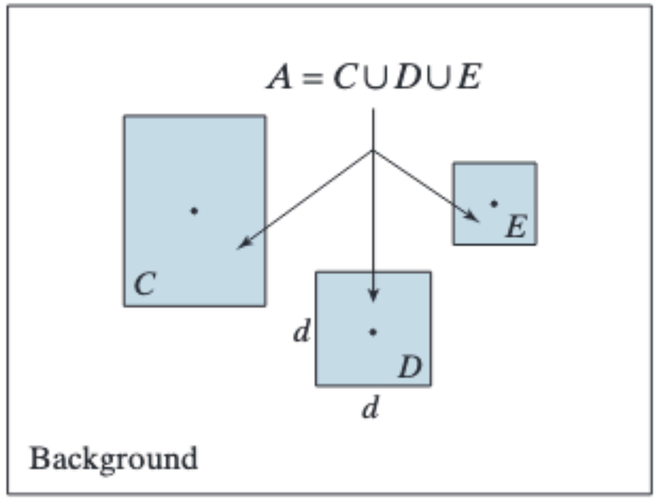

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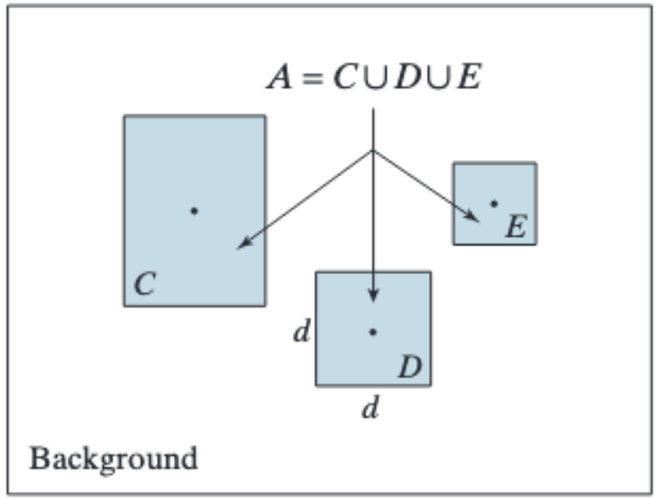

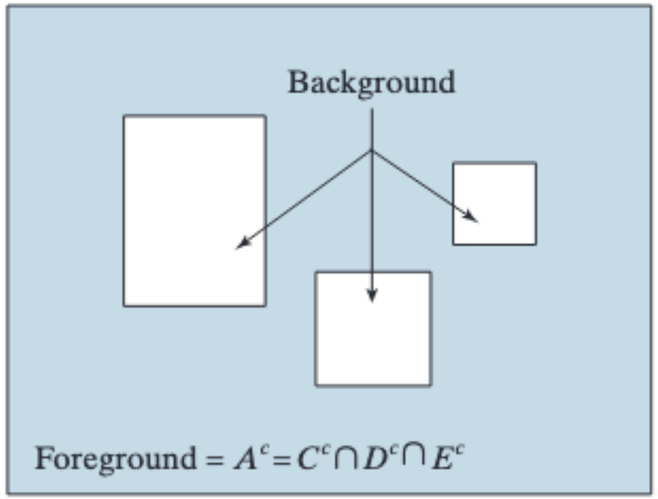

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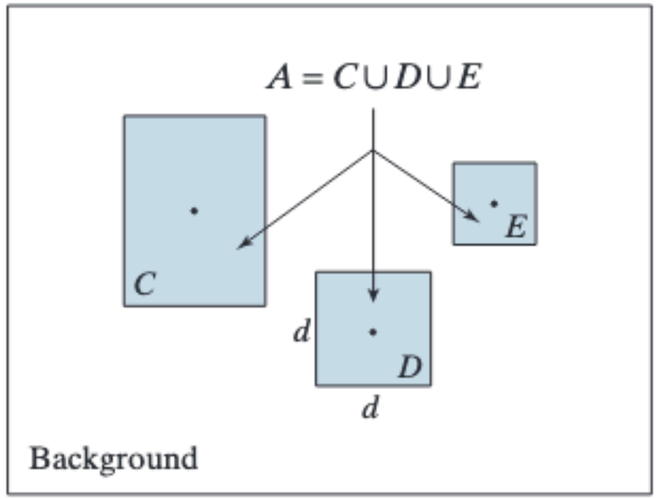

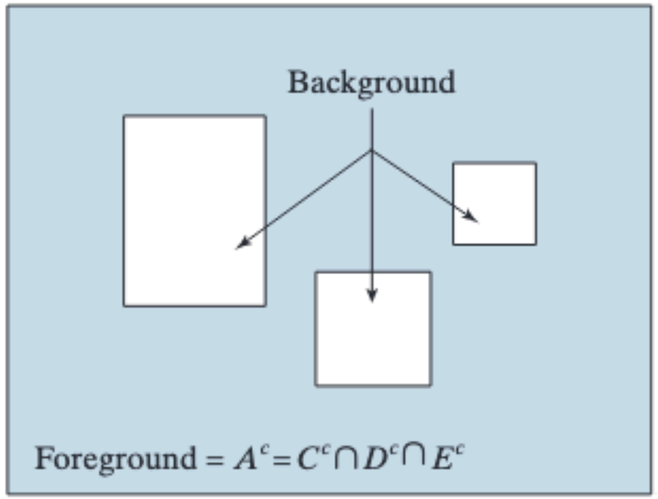

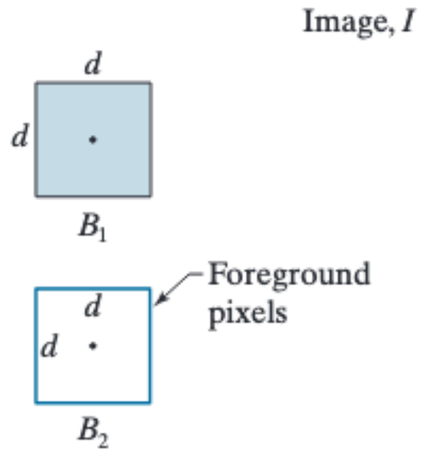

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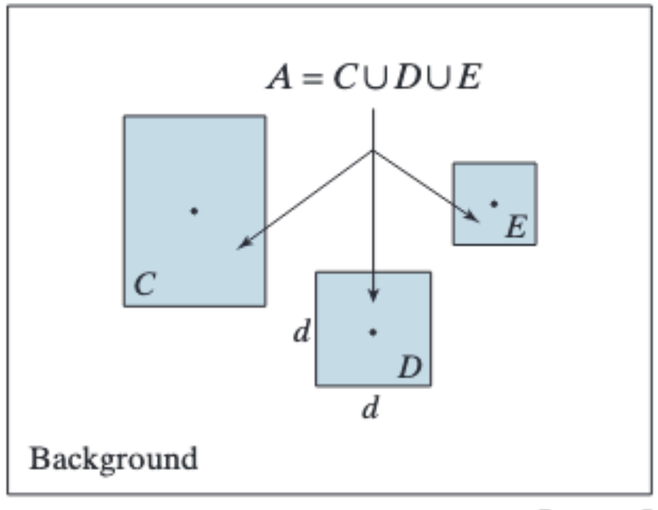

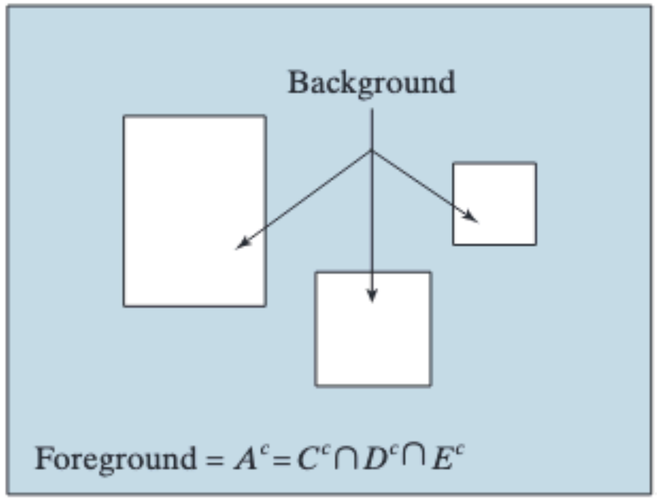

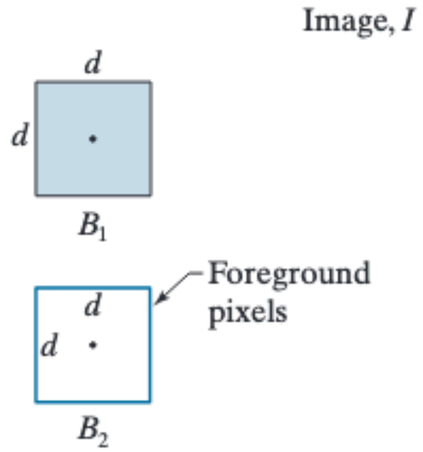

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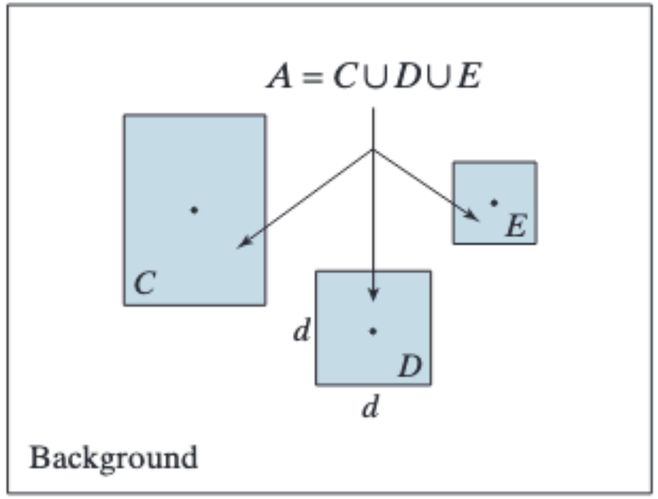

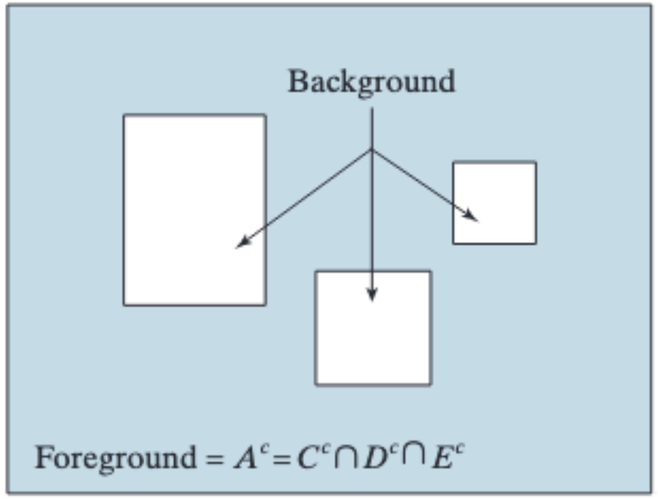

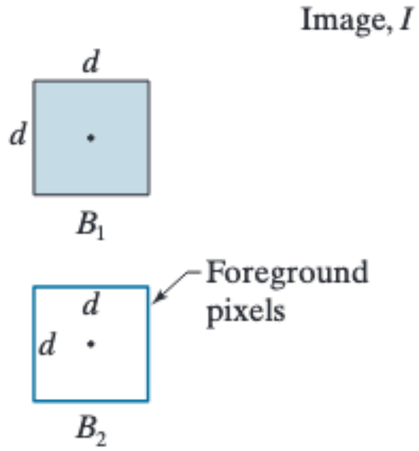

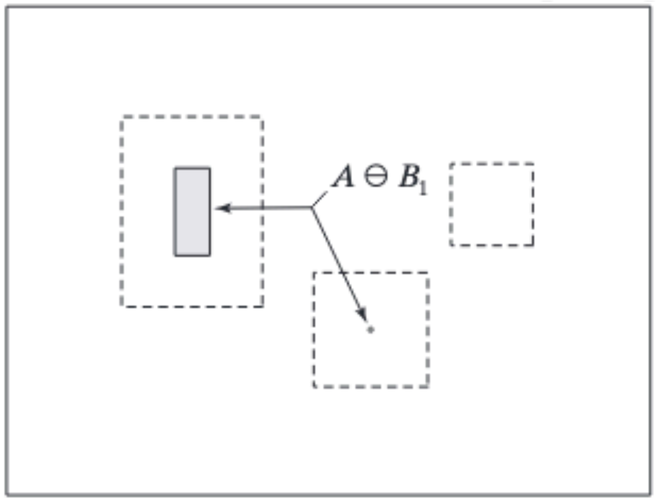

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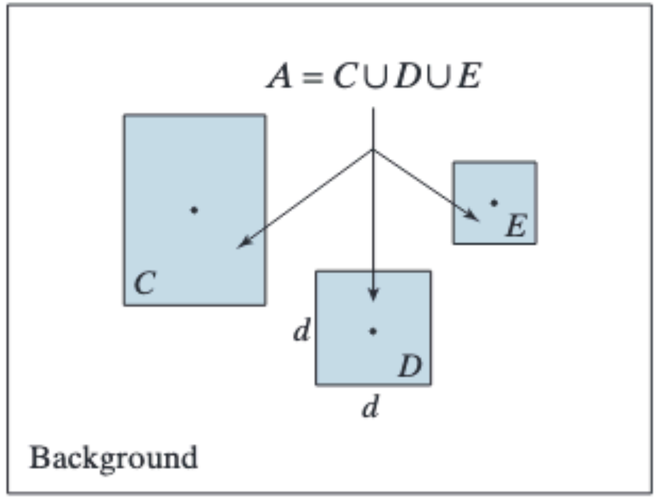

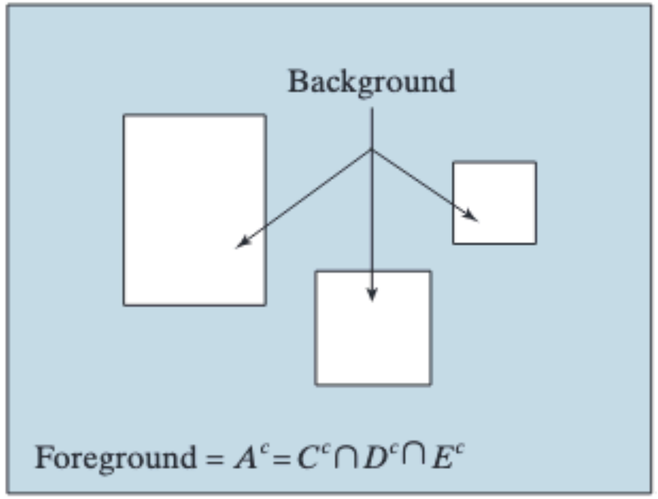

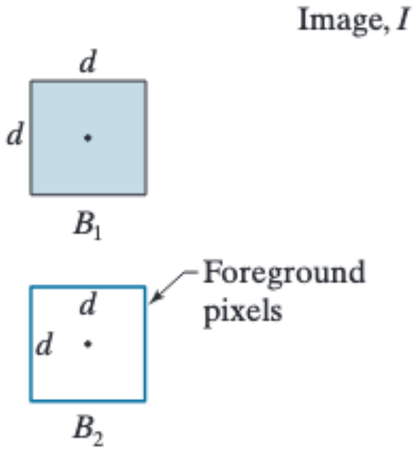

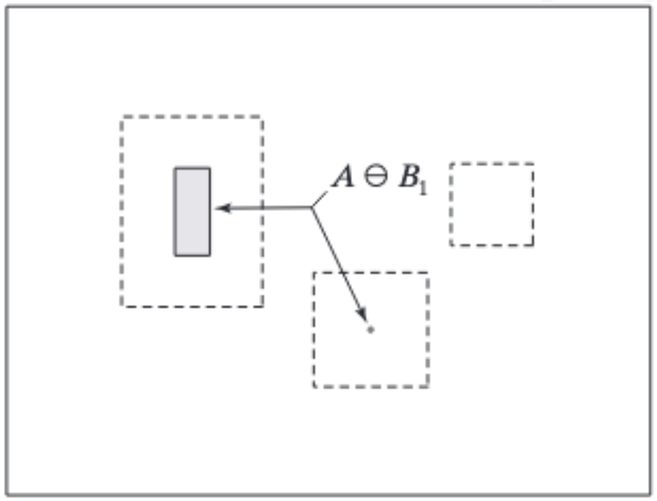

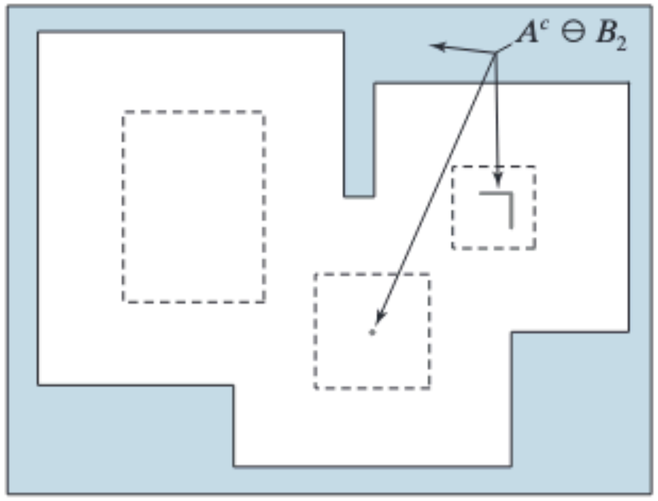

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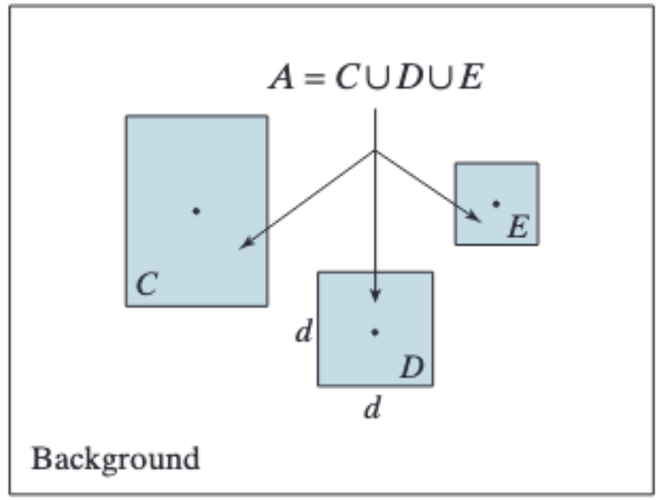

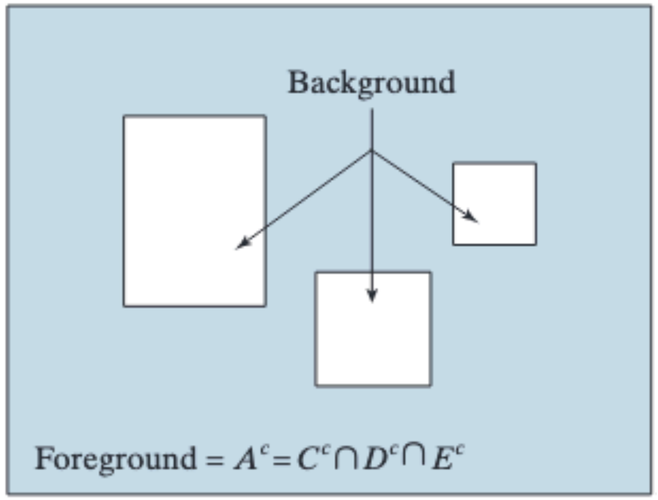

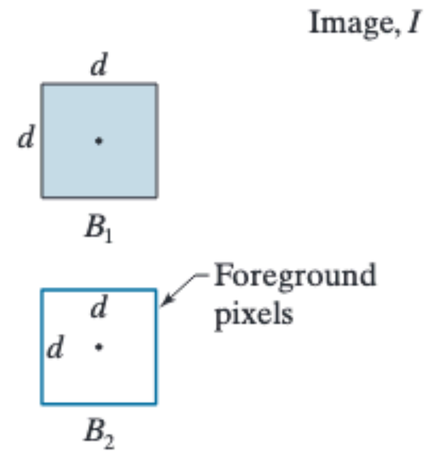

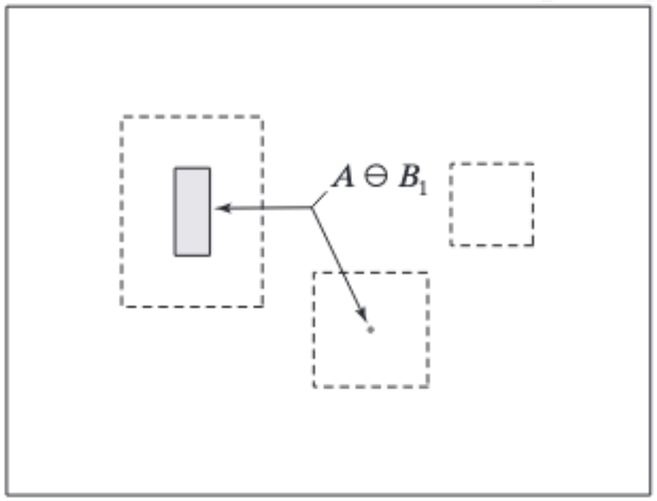

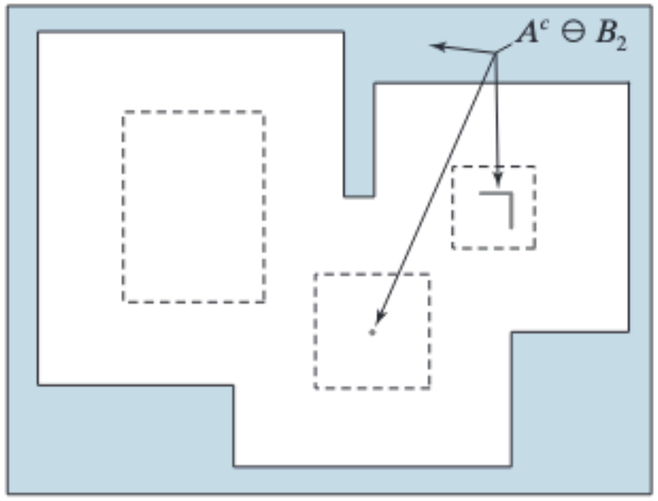

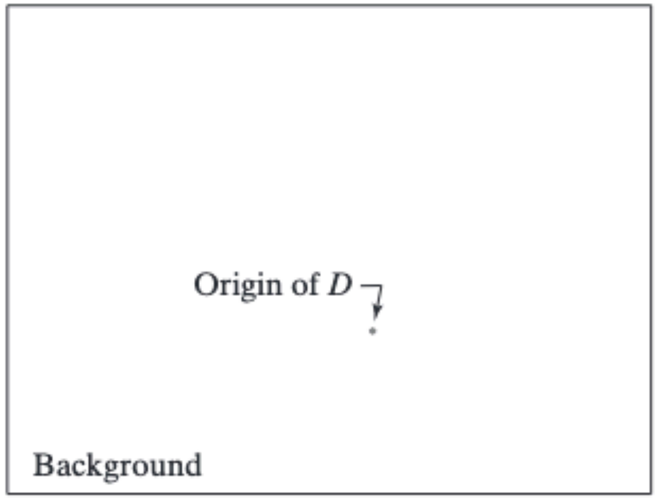

$$A \odot B = (A \ominus B_1) \cap (A^c \ominus B_2)$$

Algoritmos Morfológicos

Detecção de Bordas

$$\text{Edge}(A) = (A \oplus B) - (A \ominus B)$$

Preenchimento de Buracos

$$X_k = (X_{k-1} \oplus B) \cap A^c \quad X = \bigcup_{k=1}^{\infty} X_k \quad (\text{until } X_k = X_{k-1})$$

Extração de Componentes Conectados

$$X_k = (X_{k-1} \oplus B) \cap A \quad X = \bigcup_{k=1}^{\infty} X_k \quad (\text{until } X_k = X_{k-1})$$

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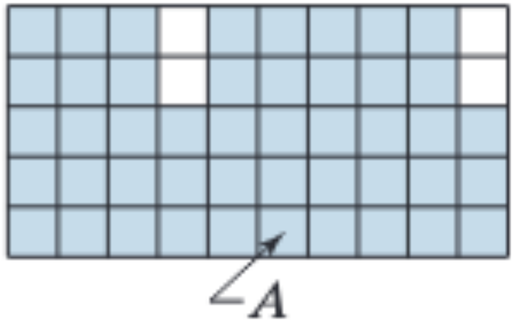

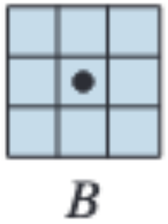

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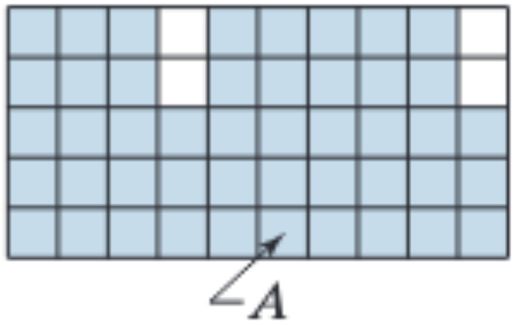

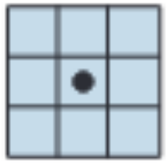

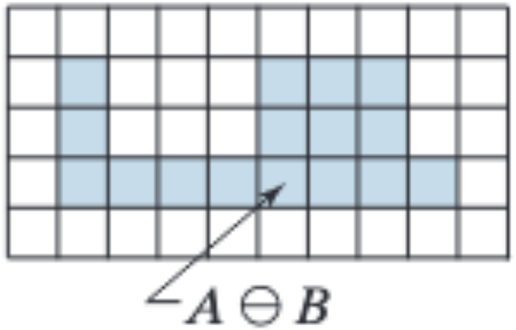

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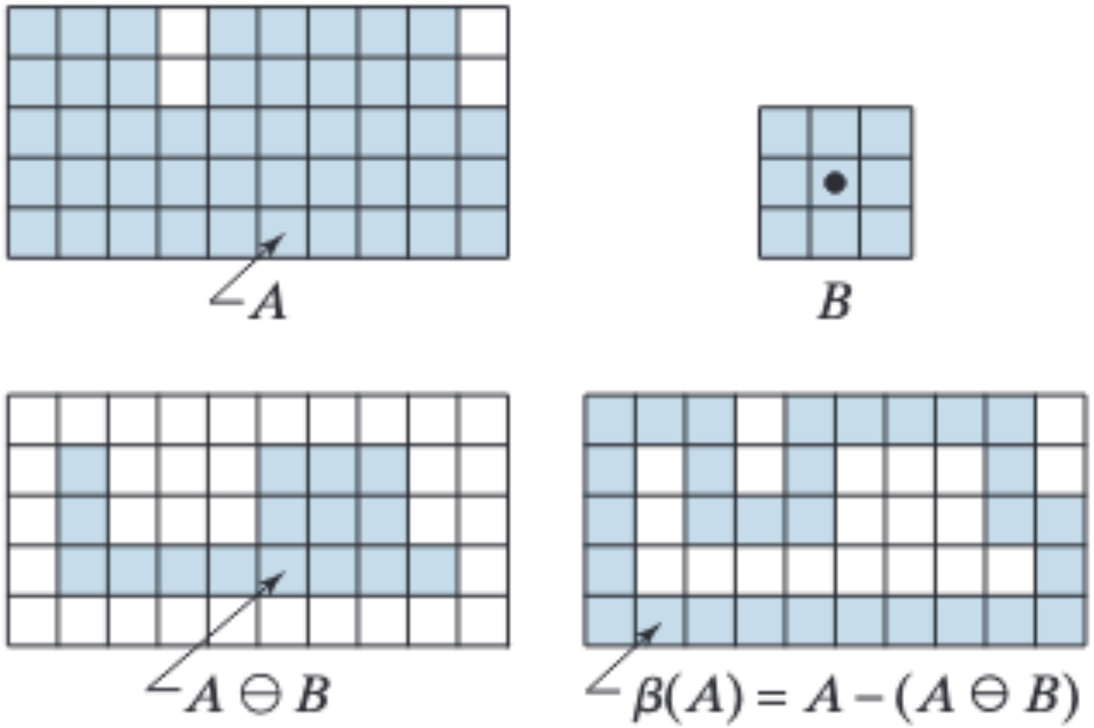

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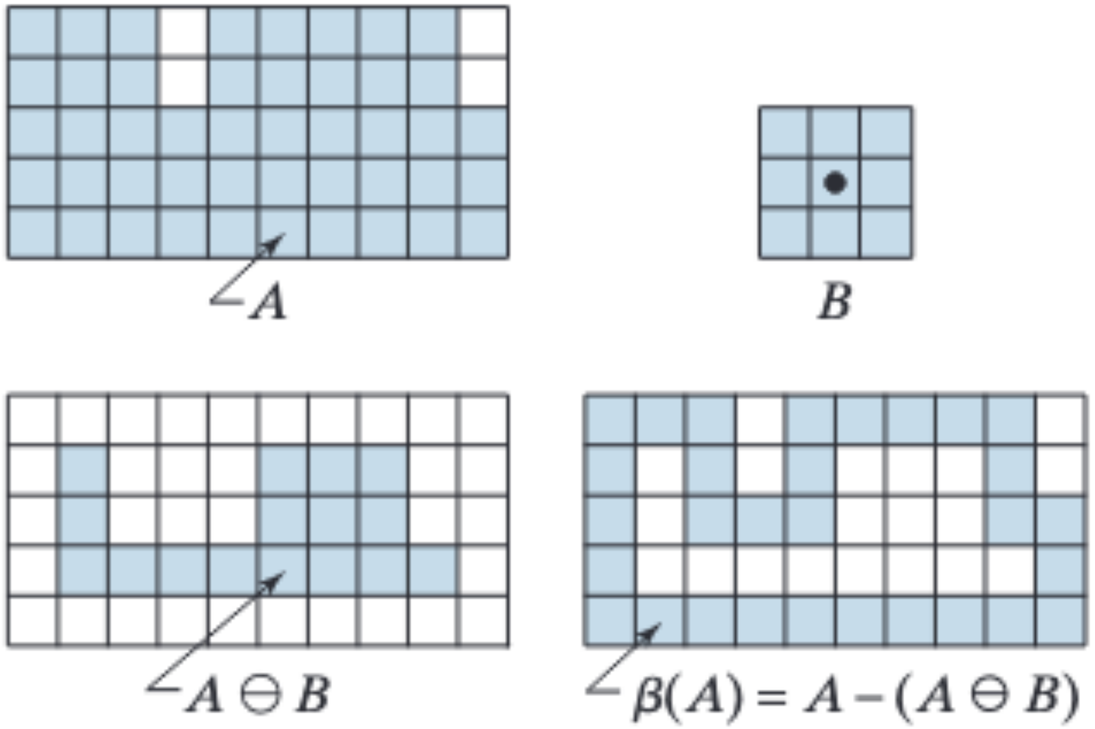

Algoritmos Morfológicos

Detecção de Bordas

$$\text{Edge}(A) = (A \oplus B) - (A \ominus B)$$

Preenchimento de Buracos

$$X_k = (X_{k-1} \oplus B) \cap A^c \quad X = \bigcup_{k=1}^{\infty} X_k \quad (\text{until } X_k = X_{k-1})$$

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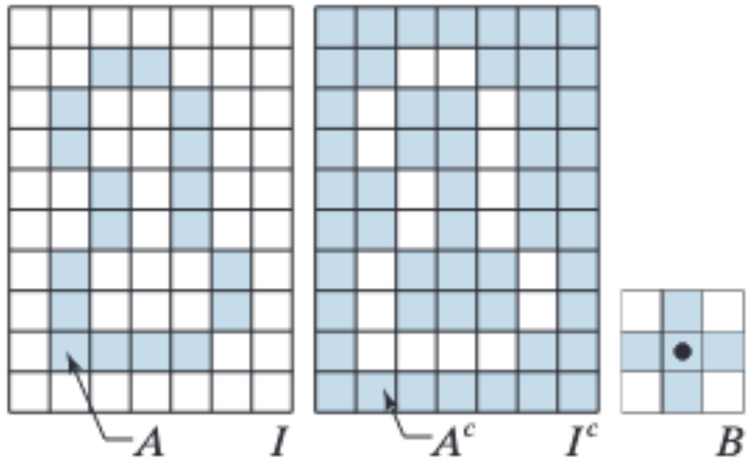

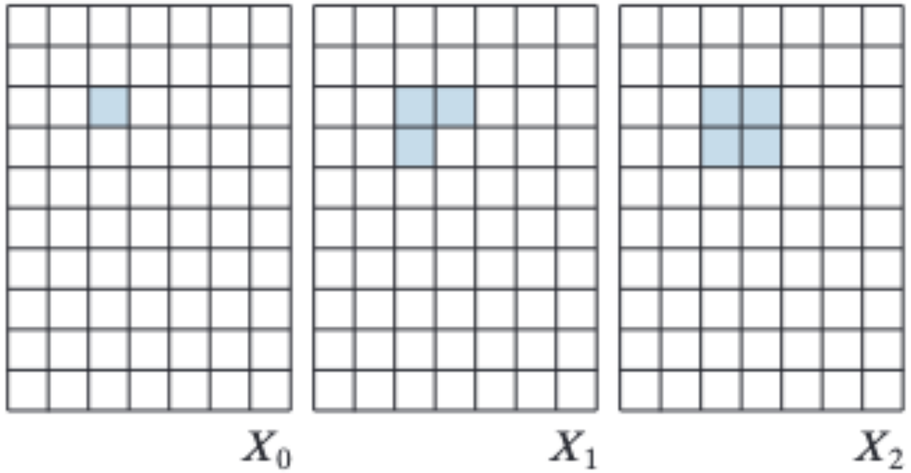

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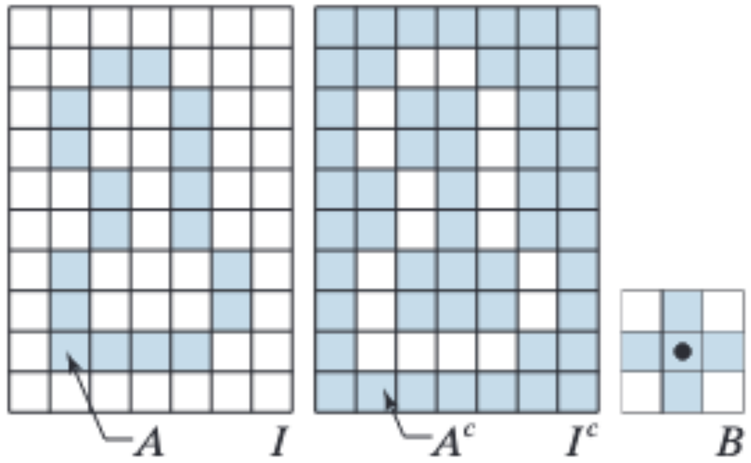

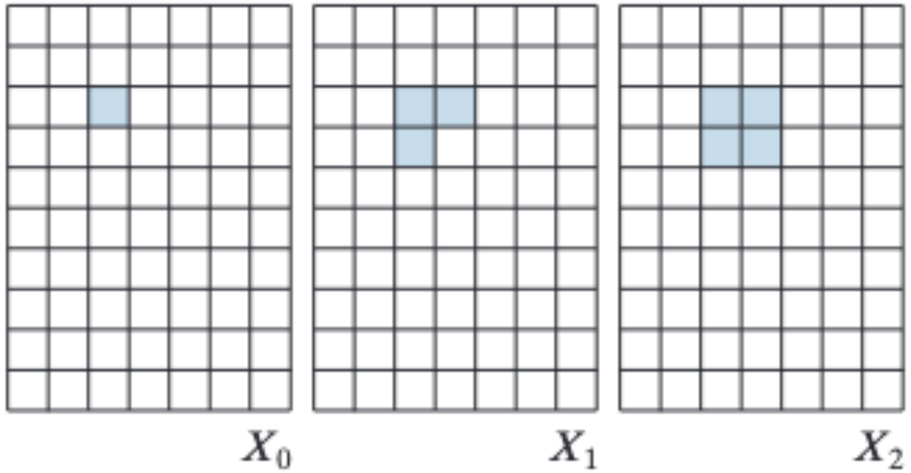

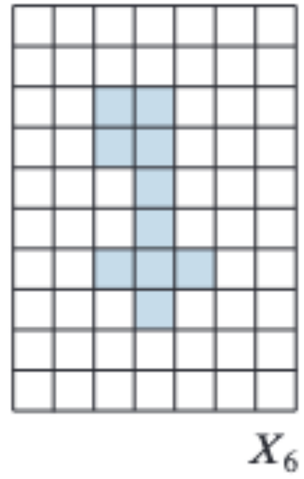

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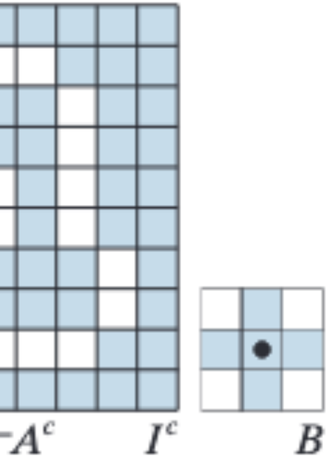

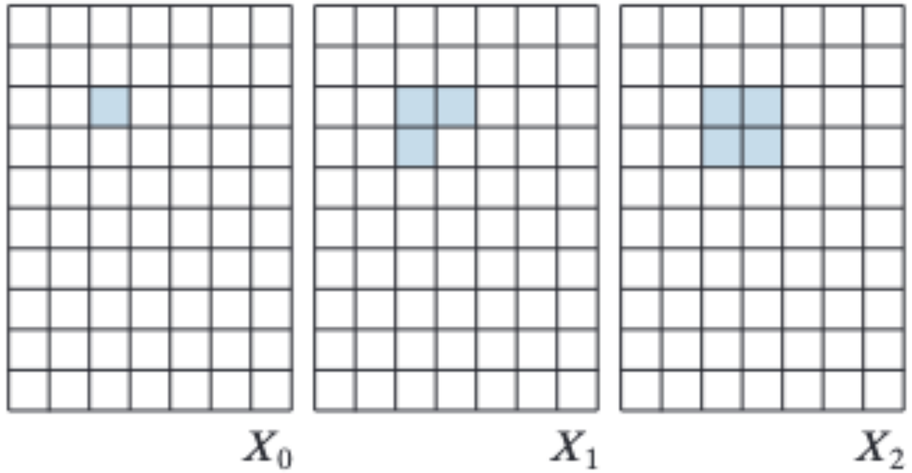

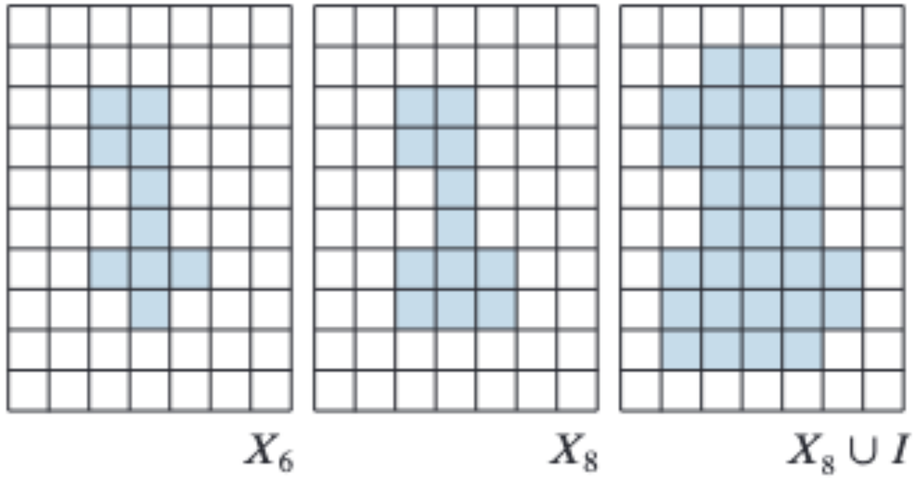

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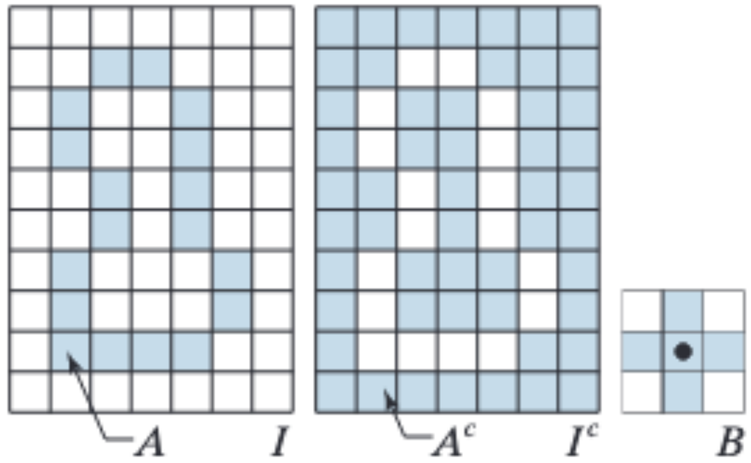

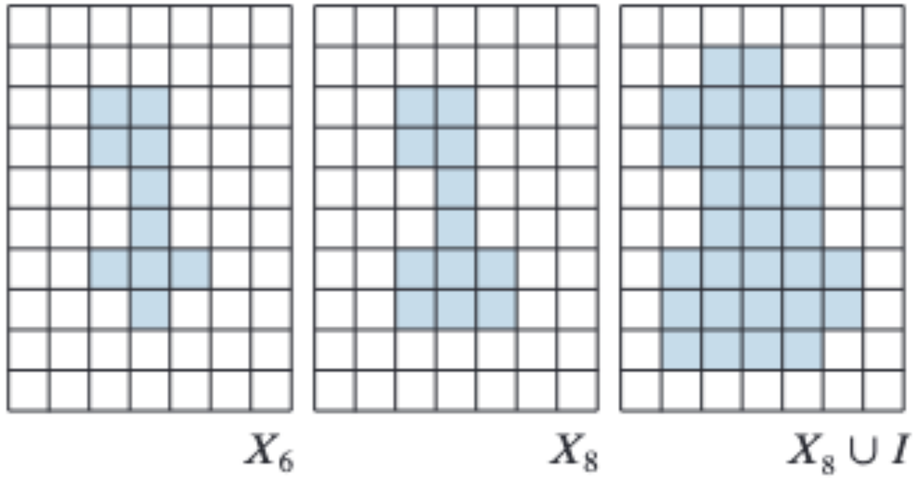

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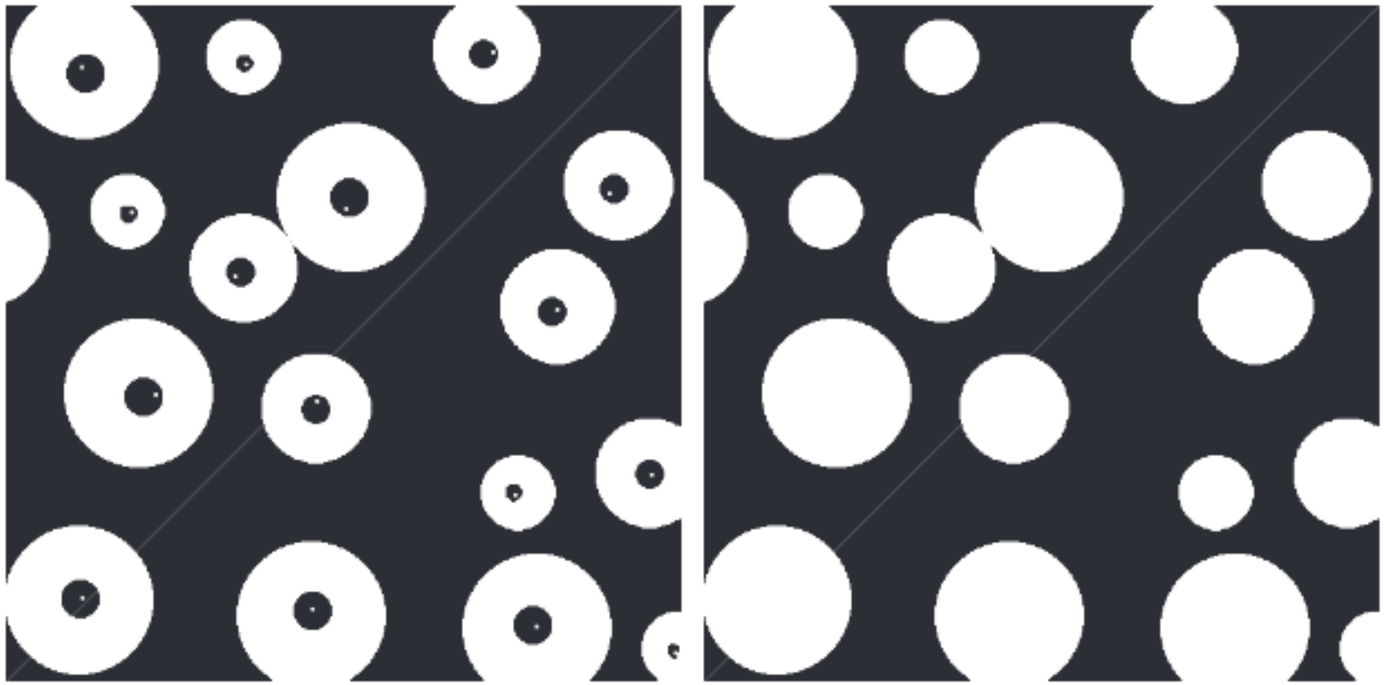

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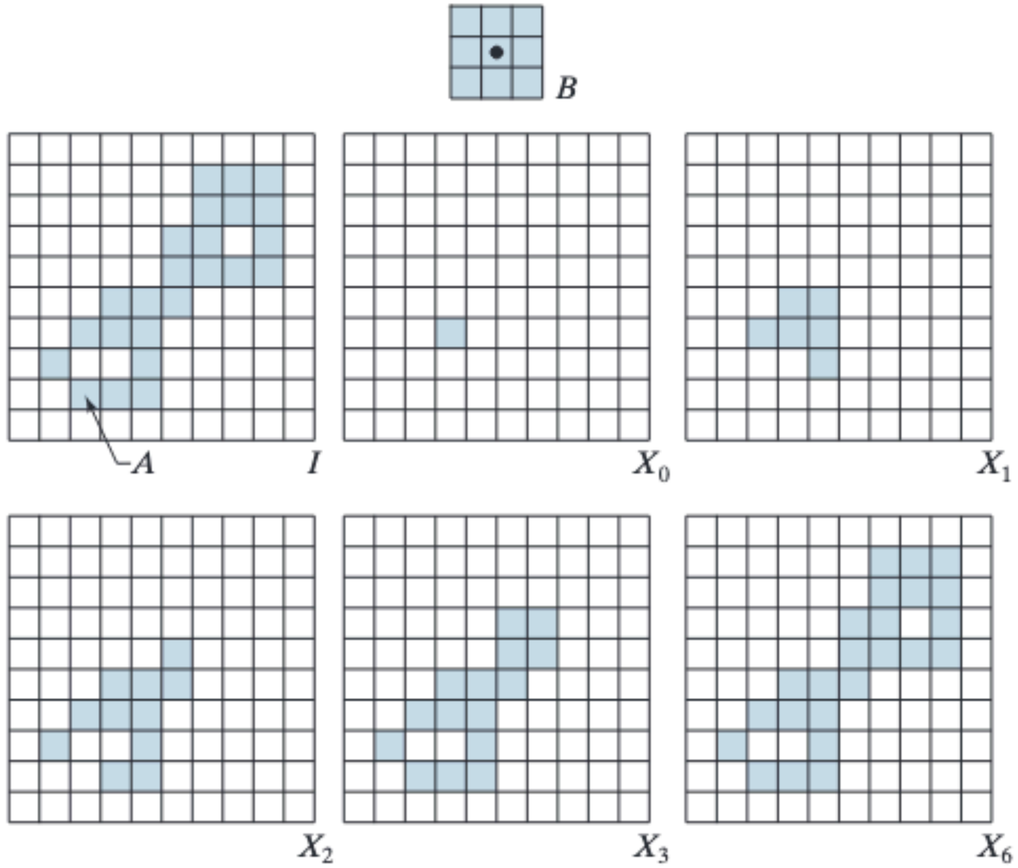

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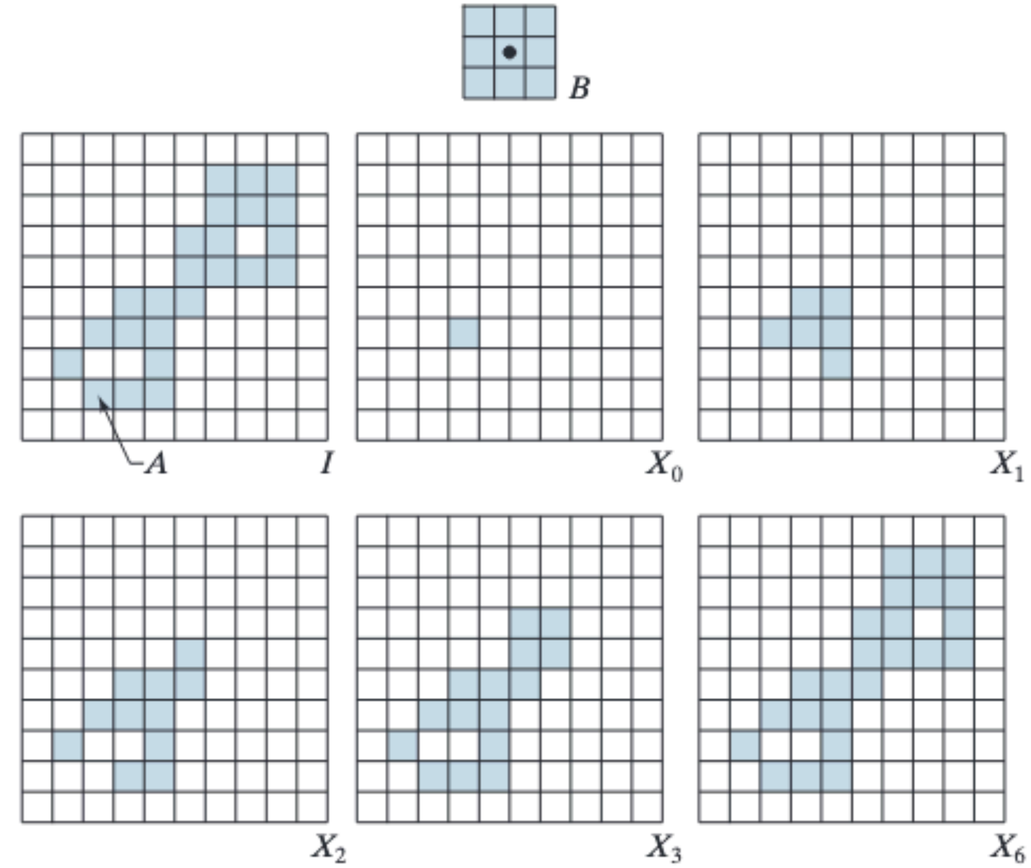

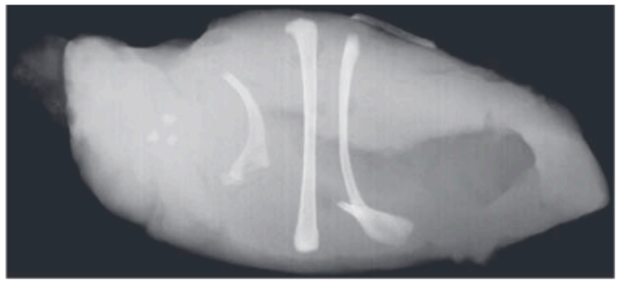

Connected component	No. of pixels in connected comp
01	11
02	9
03	9
04	39
05	133
06	1
07	1
08	743
09	7
10	11
11	11
12	9
13	9
14	674
15	85

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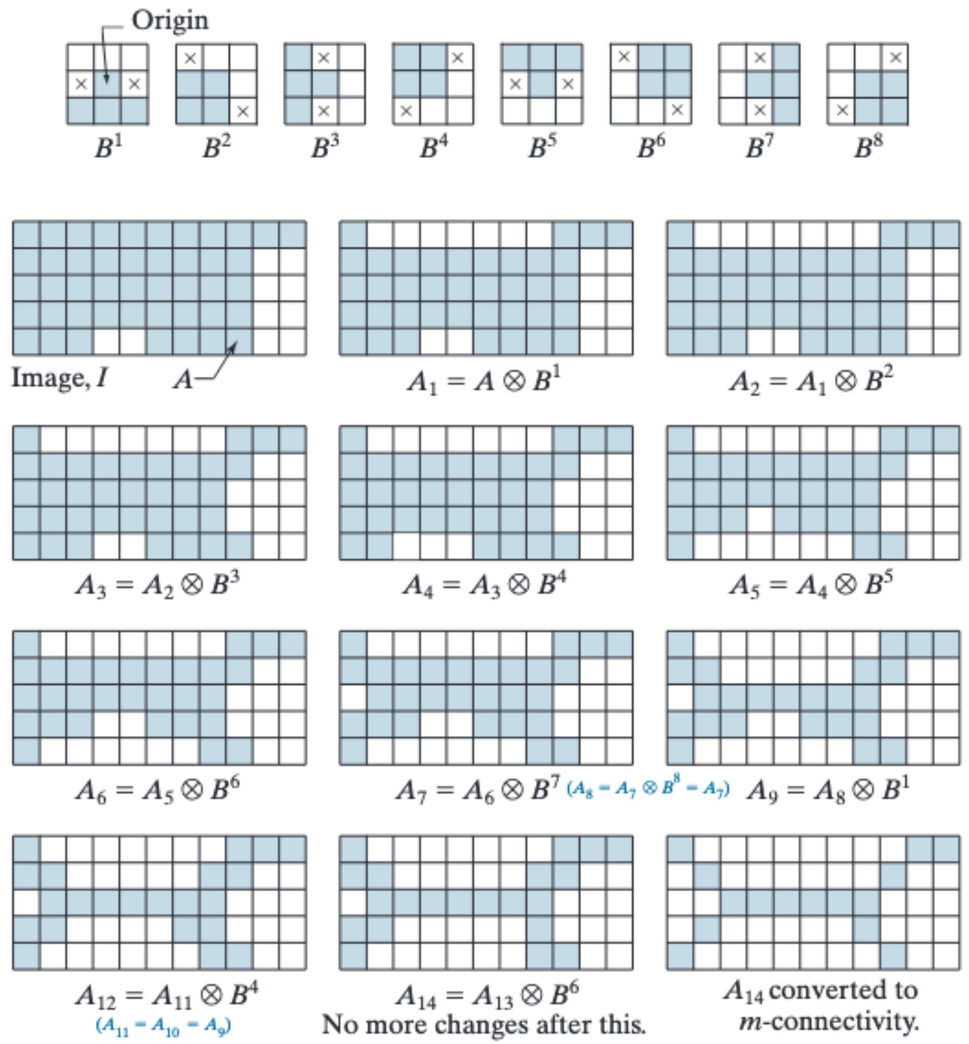

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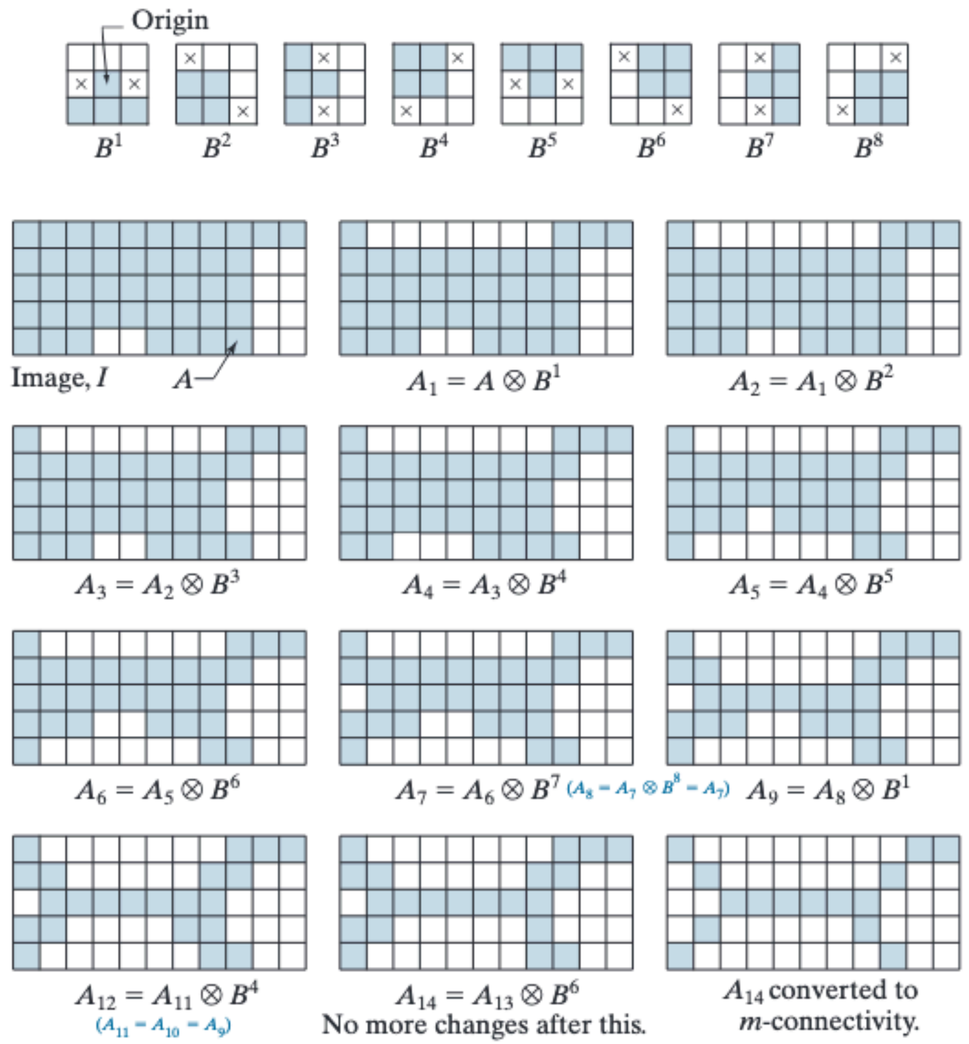

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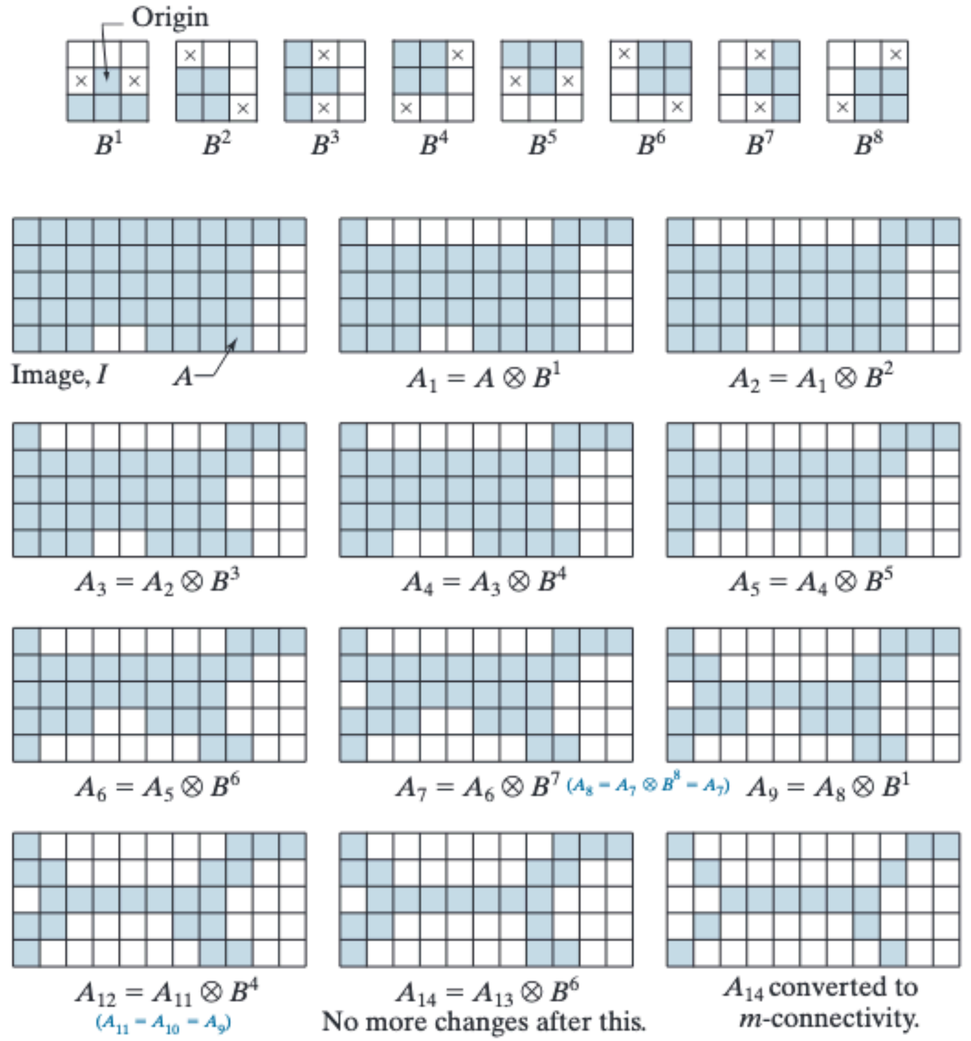

SCC 0251
Aula 21

SCC0251
Processamento de Imagens

Processamento de Imagens em Cores

Professora Leo Sampaio Ferraz Ribeiro