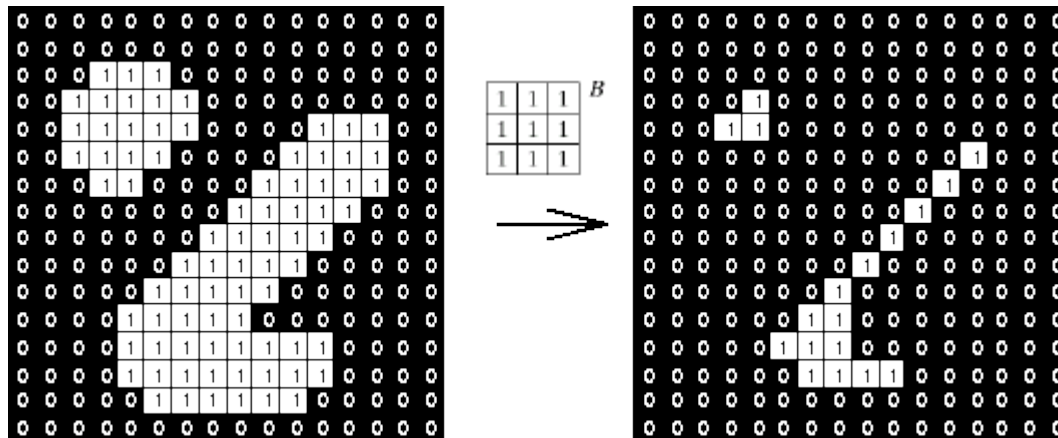


binary image morphology

a repetition of the basics

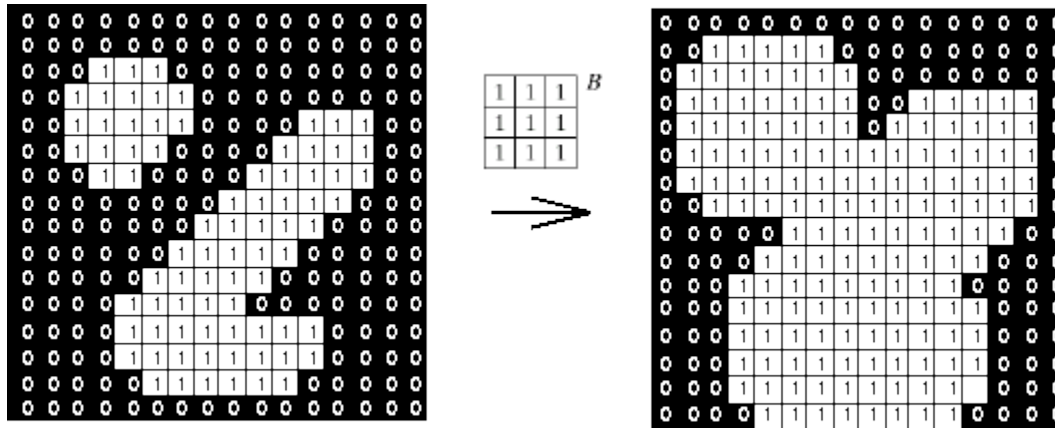
Erosion

$$A \ominus B = \{z \in E \mid B_z \subseteq A\}$$



Dilation

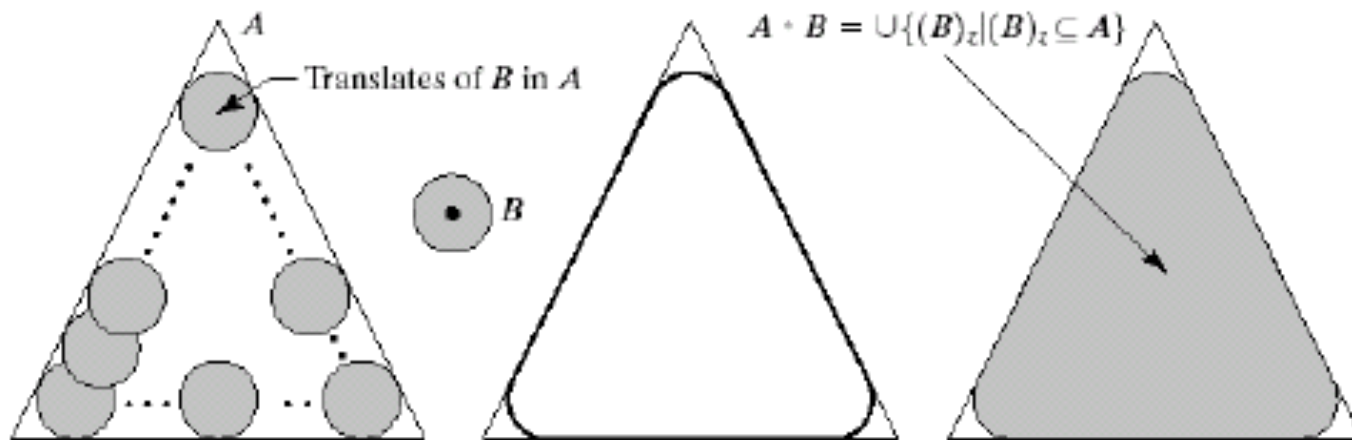
$$A \oplus B = \{z \in E \mid B_z \cap A \neq \emptyset\}$$



Opening

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

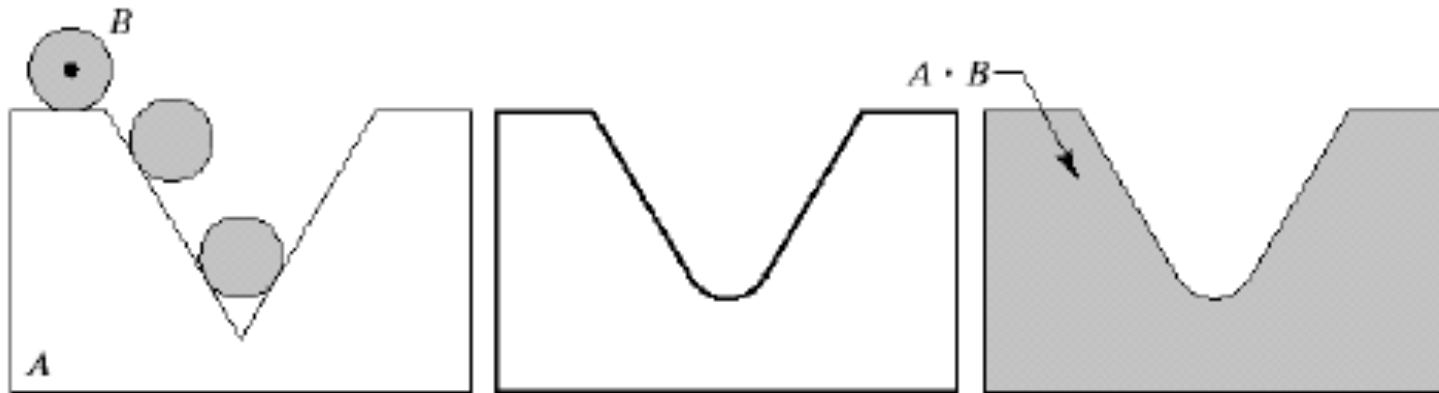
- smoothes outlines
- breaks narrow connections



Closing

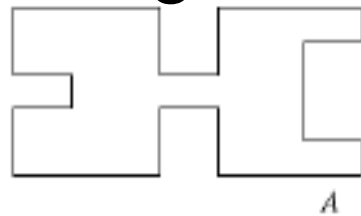
$$A \cdot B = (A \oplus B) \ominus B$$

- smoothes outlines
- fills holes
- connects narrow gaps

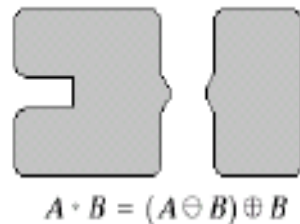
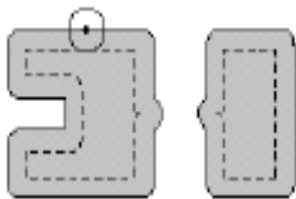
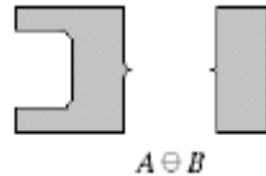
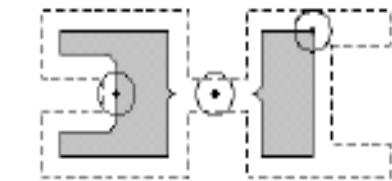


Opening vs Closing

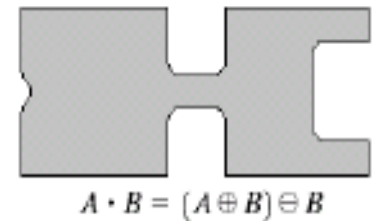
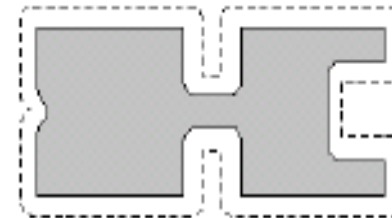
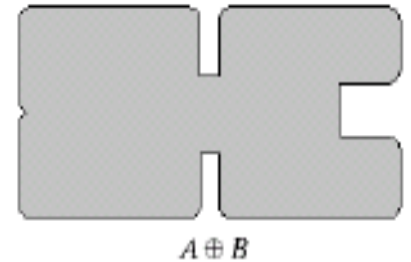
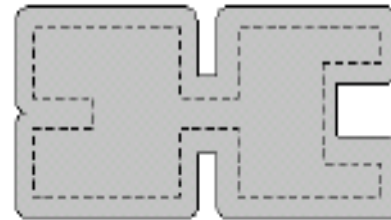
original



Opening



Closing

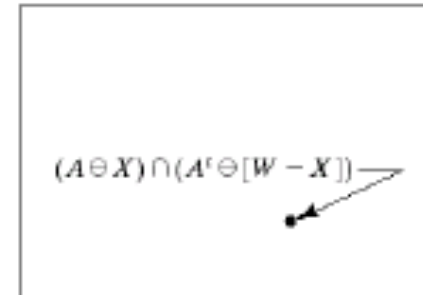
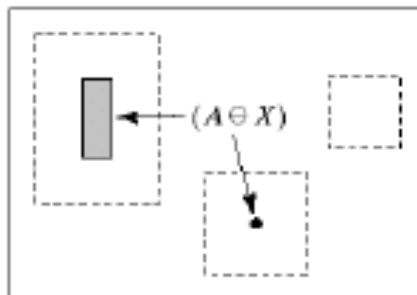
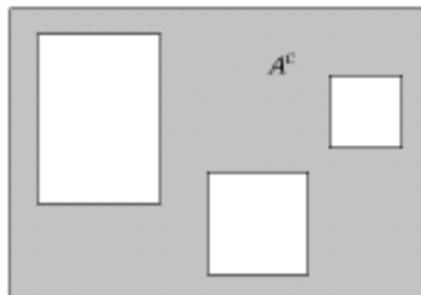
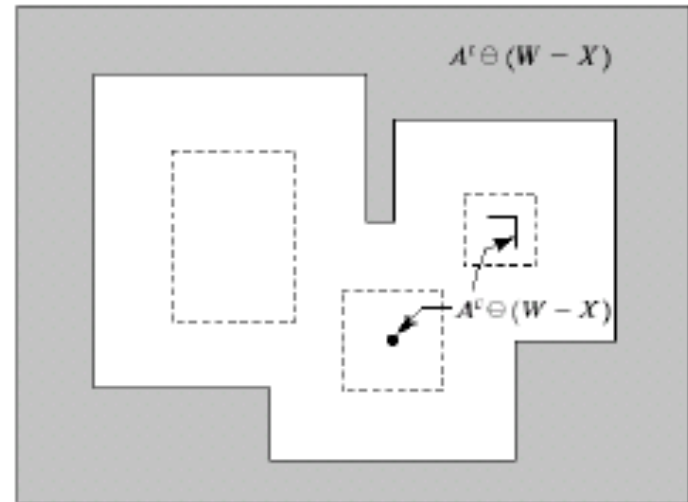
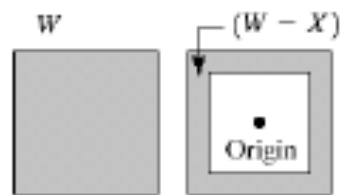
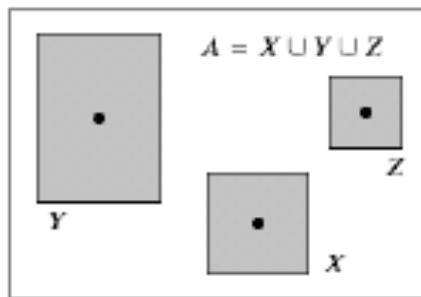


Example



Hit or Miss Transform

$$A \odot (B, C) = (A \ominus B) \cap (A^c \ominus C)$$



Example

Detection of convex corners with Hit or Miss Transform using 4 structuring elements

