Digital Image Processing

Binarization, Erosion, Dilation, Opening, and Closing

22-Jun-22

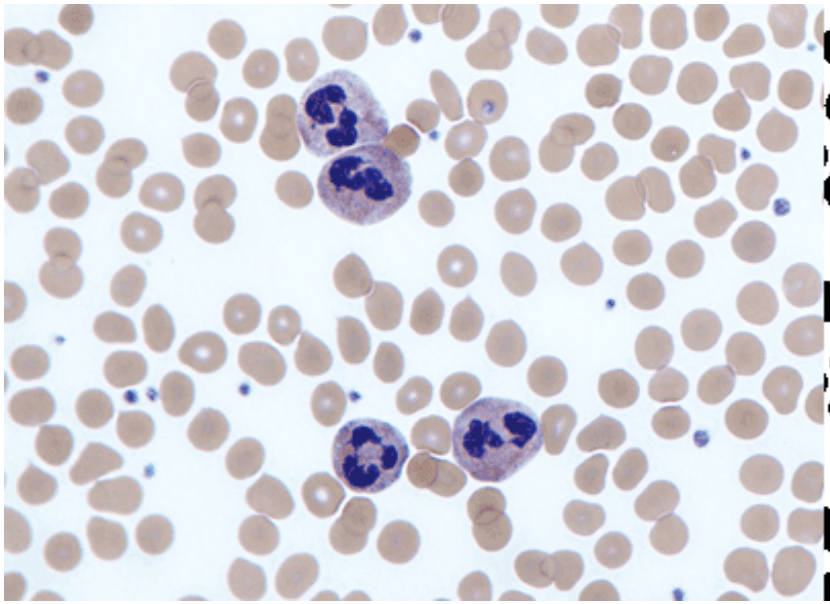
Binarization

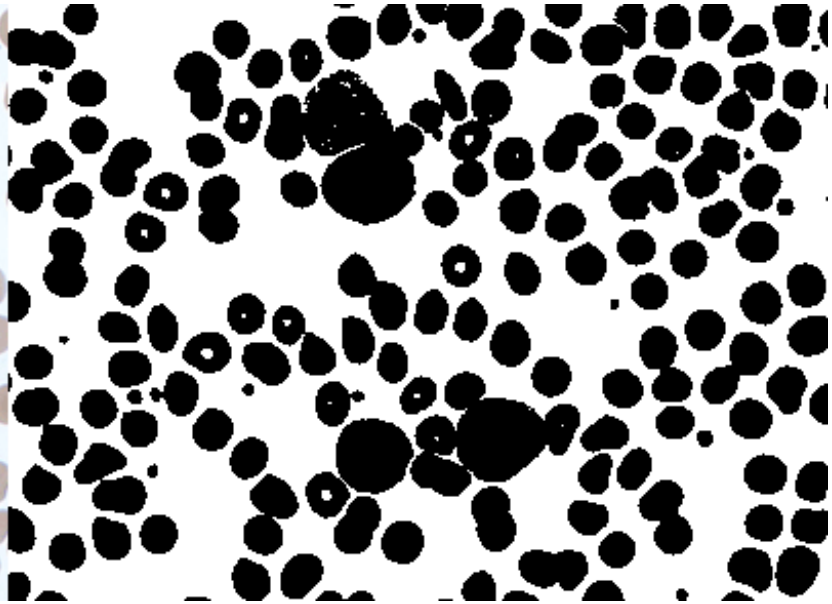
- In digital image processing, thresholding is the simplest method of segmenting images. From a grayscale image, thresholding can be used to create binary images.

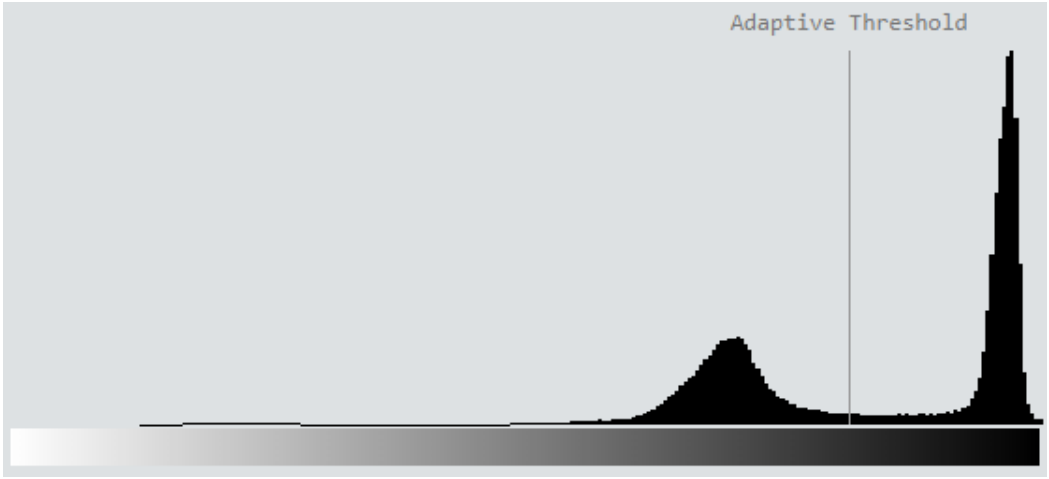
Original image

Example of a threshold effect used on an image

Binarization

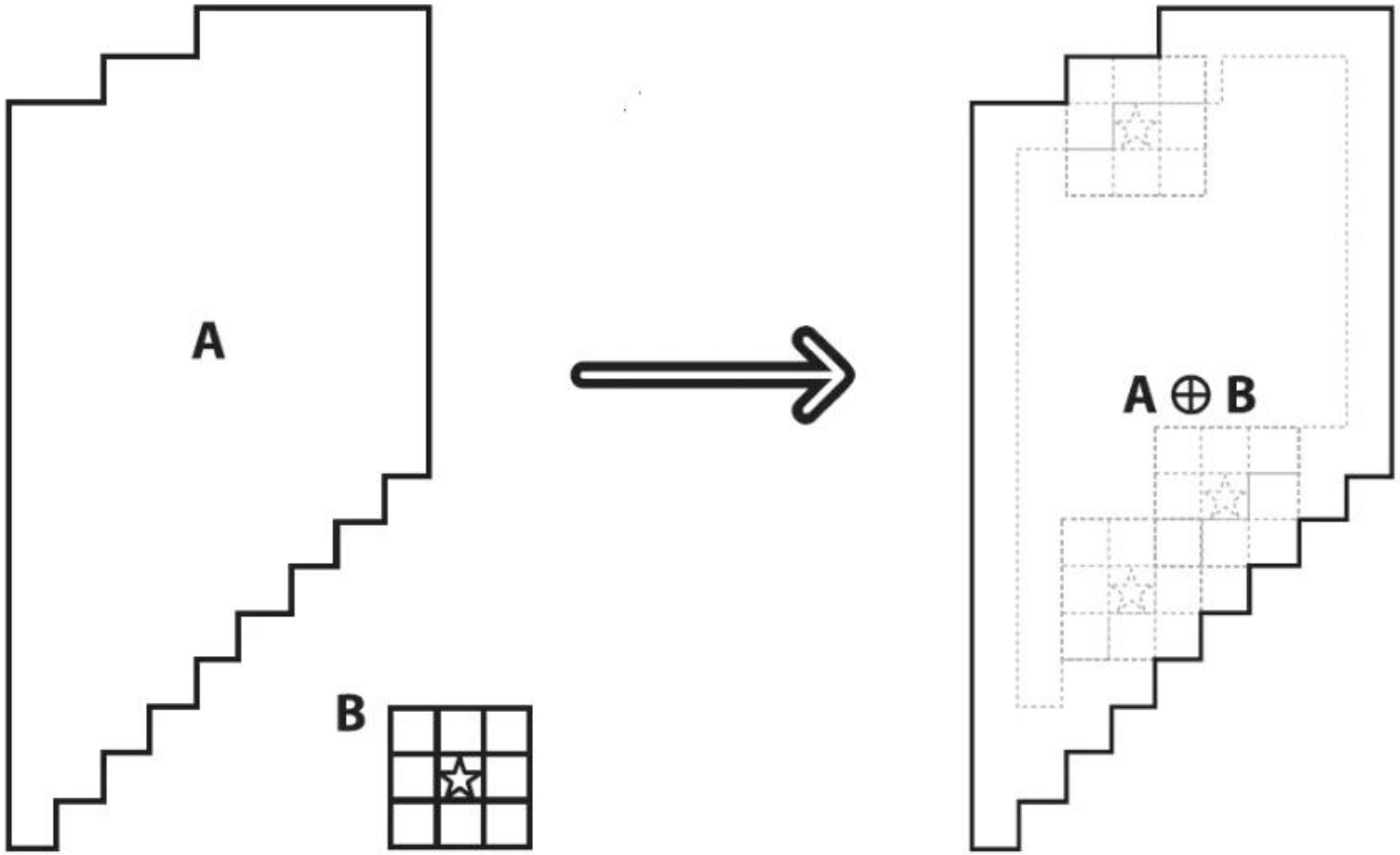






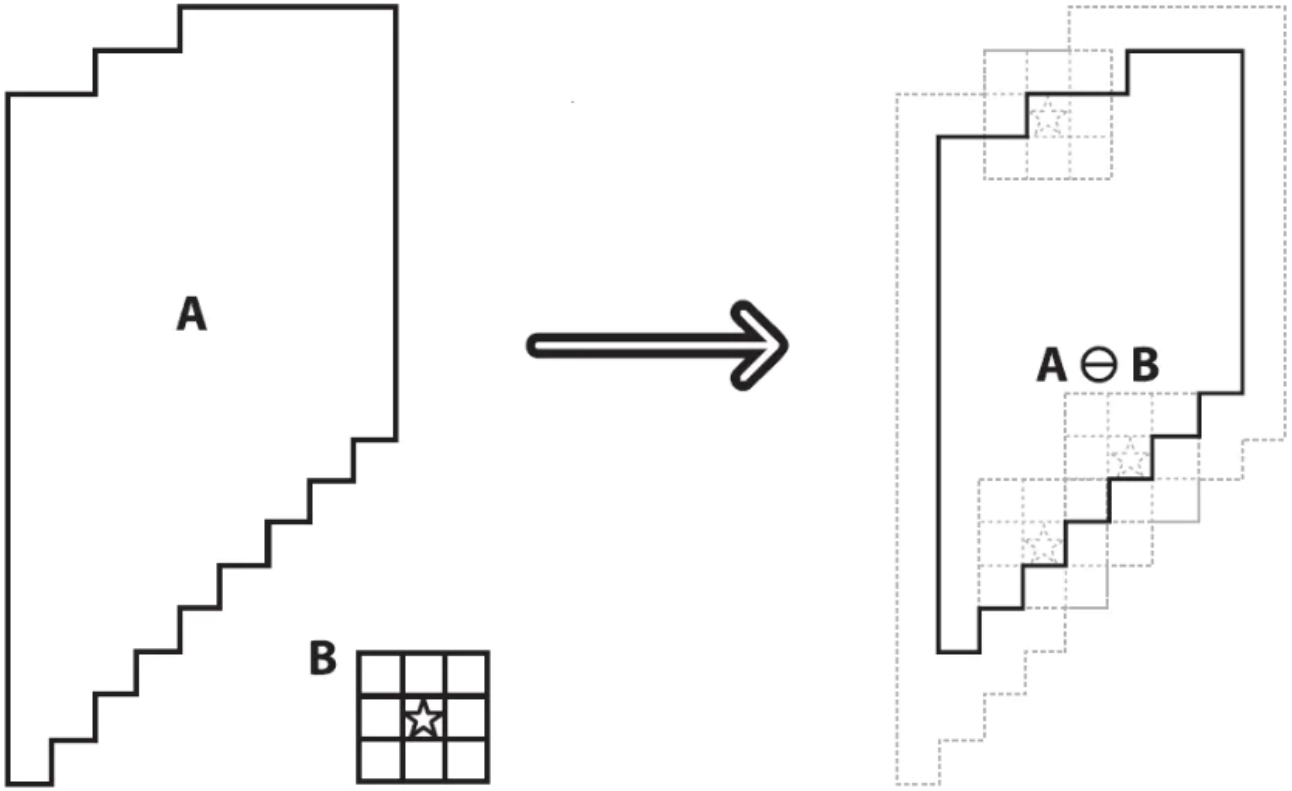
Dilation

- $A \oplus B = \{x | B_x \cap A \neq \emptyset\}$



Erosion

- $A \ominus B = \{x | B_x \subseteq A\} = \bigcap_{b \in B} A_{-b}$



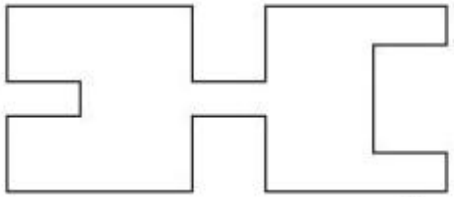
Opening and Closing

- **Opening (Erosion -> Dilation)**

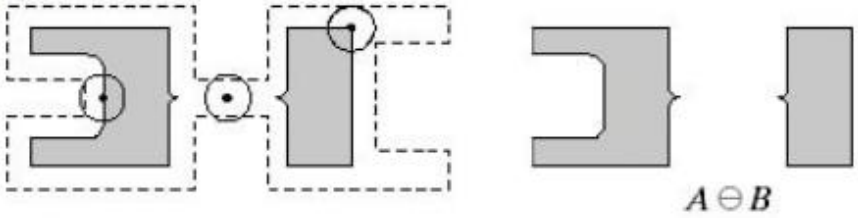
$$A \circ B = (A \ominus B) \oplus B$$

- **Closing (Dilation -> Erosion)**

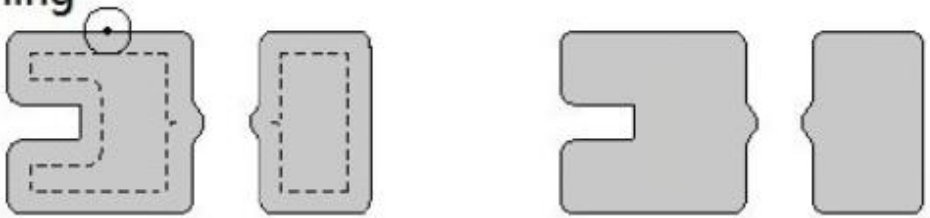
$$A \bullet B = (A \oplus B) \ominus B$$



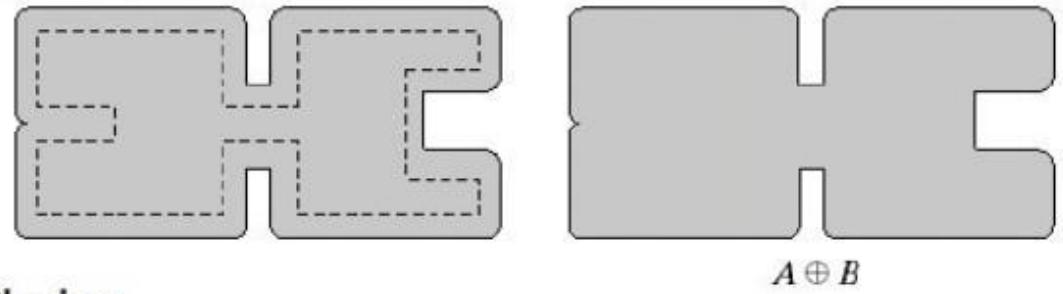
Erosion



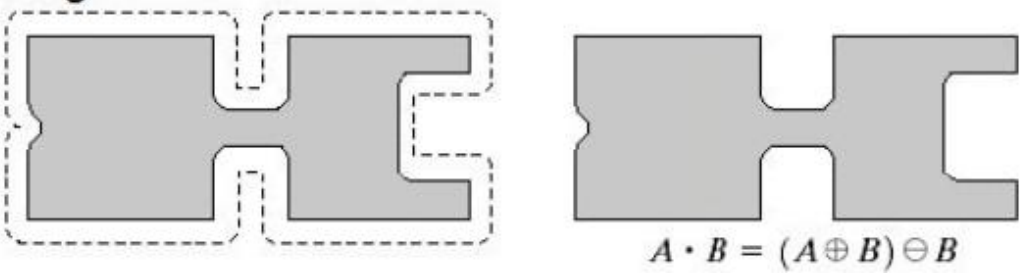
Opening



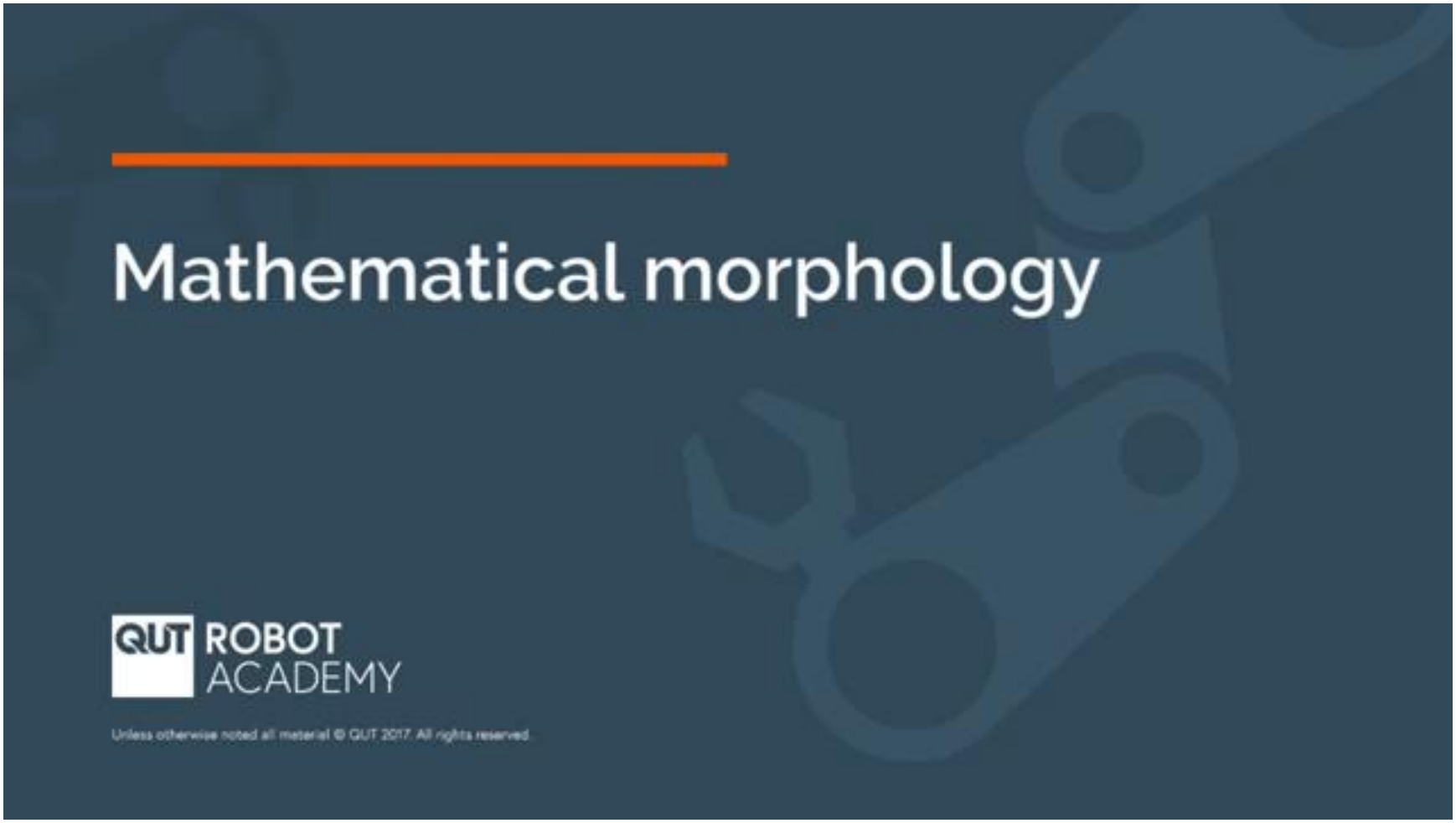
Dilation



Closing



Dilation & Erosion



https://www.youtube.com/watch?time_continue=288&v=zZFcONMwLYI&feature=emb_logo

References

- https://felixniklas.com/imageprocessing/binarization
- https://en.wikipedia.org/wiki/Mathematical_morphology
- https://www.jianshu.com/p/e853069e19a8