

Digital Image Processing
U10M12021

Morphological Image Processing Erosion and Dilation

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2022 Spring Semester

Morphological Operations

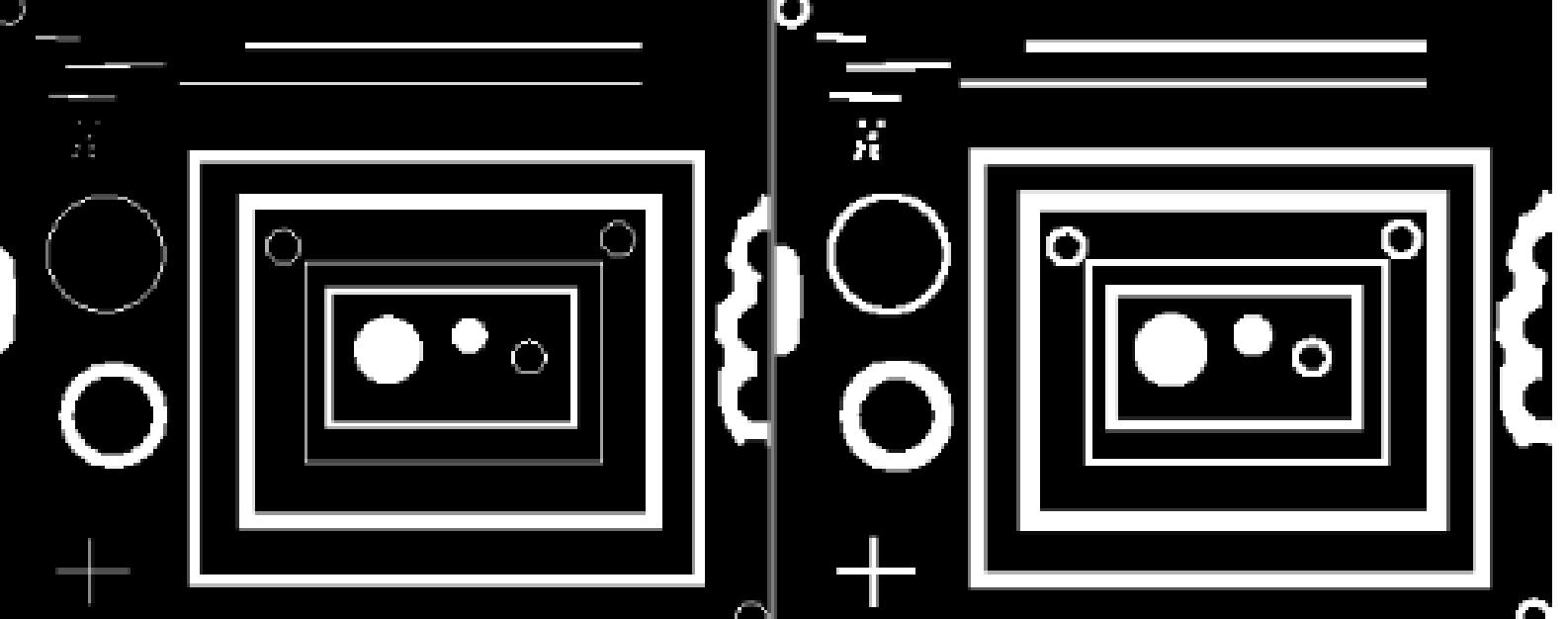
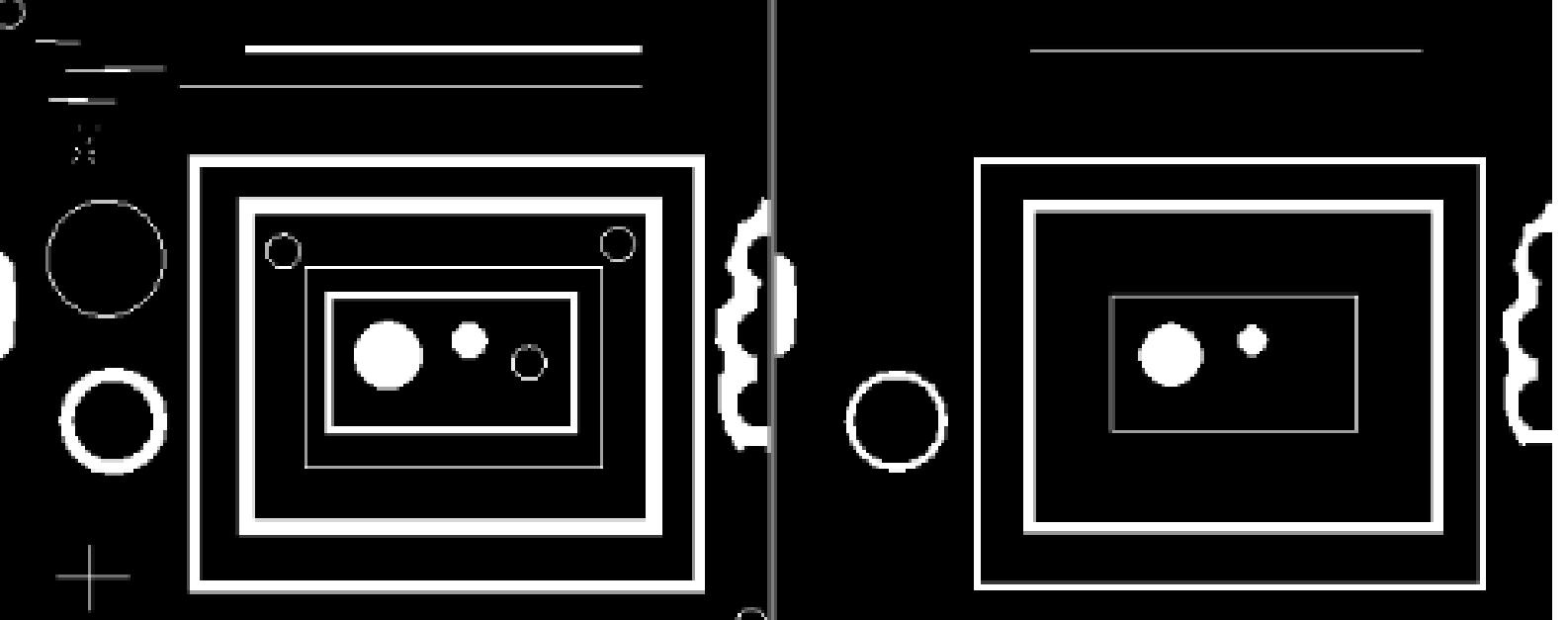
- What is Morphology?
- What is Mathematical Morphology?
- What are the most basic Morphology Operations?

*Morphological Operations are especially suited for processing **binary images** and **greyscale images**.*

Erosion and Dilation

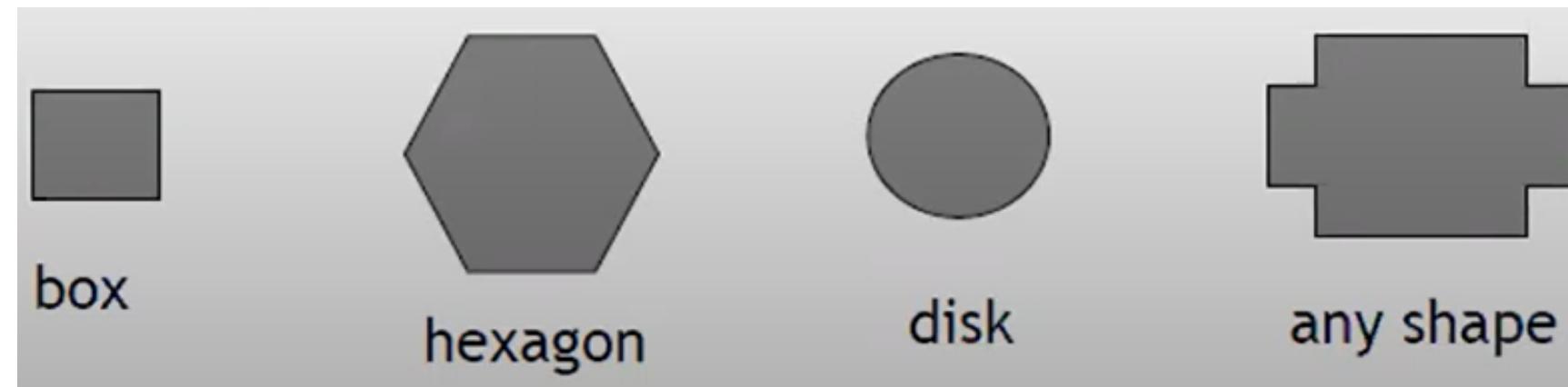
- Erosion: Shrinks
- Dilation: Grow

*The state of any given pixel in the output image is determined by applying a **rule** to the corresponding pixel and its neighbors in the input image. The **rule used** to process the pixels **defines the operation** as a dilation or an erosion.*

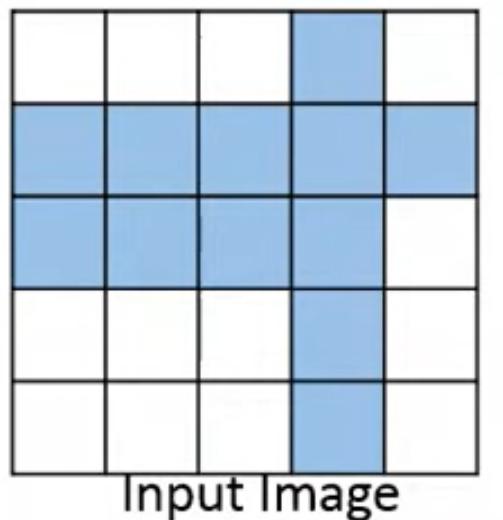
Operation	Rule	Example (Original and Processed Image)
Dilation	<p>The value of the output pixel is the maximum value of all pixels in the neighborhood. In a binary image, a pixel is set to 1 if any of the neighboring pixels have the value 1.</p> <p>Morphological dilation makes objects more visible and fills in small holes in objects. Lines appear thicker, and filled shapes appear larger.</p>	
Erosion	<p>The value of the output pixel is the minimum value of all pixels in the neighborhood. In a binary image, a pixel is set to 0 if any of the neighboring pixels have the value 0.</p> <p>Morphological erosion removes floating pixels and thin lines so that only substantive objects remain. Remaining lines appear thinner and shapes appear smaller.</p>	

Structure element

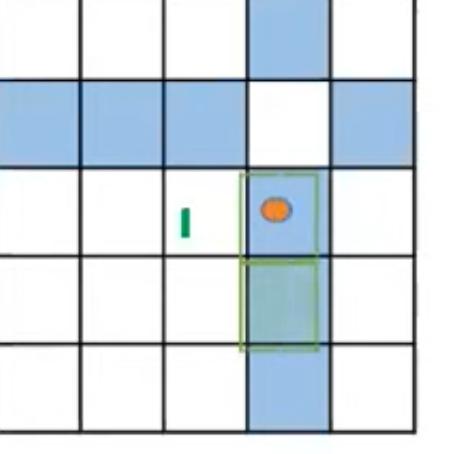
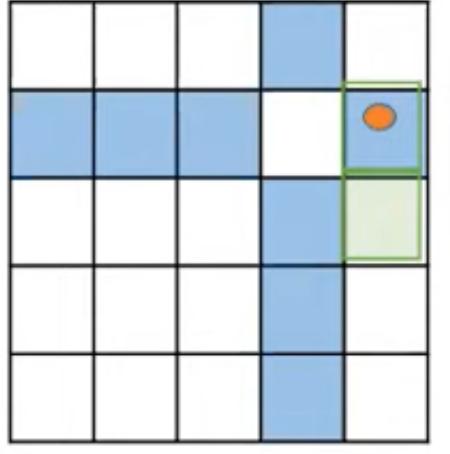
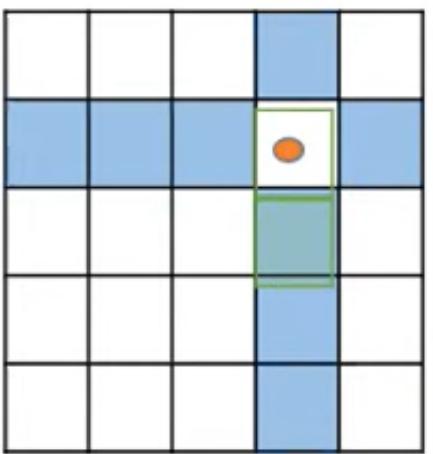
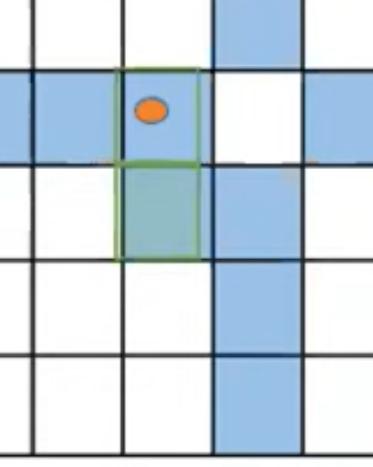
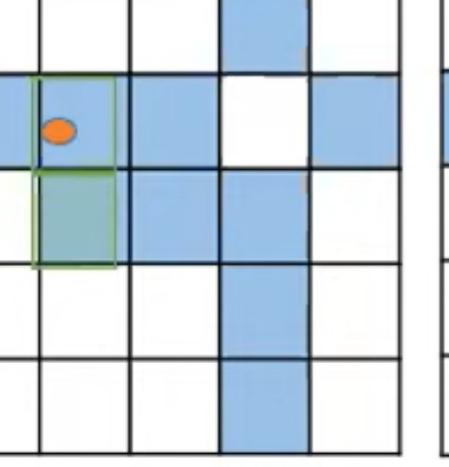
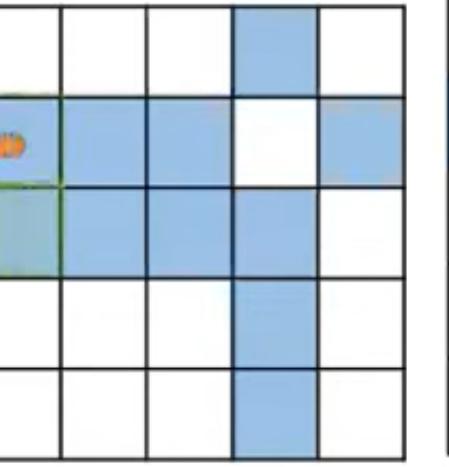
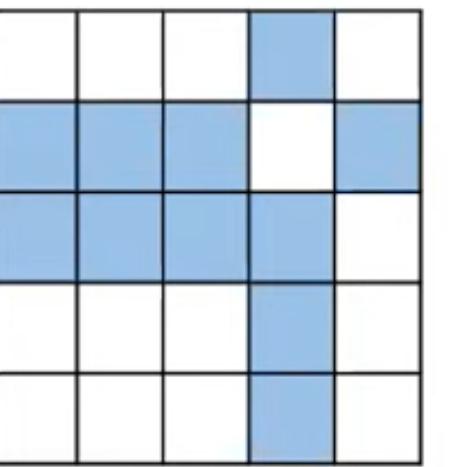
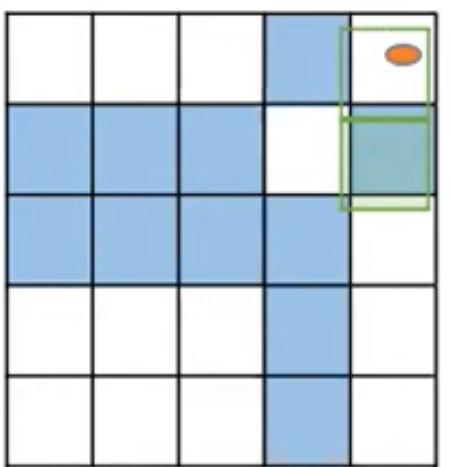
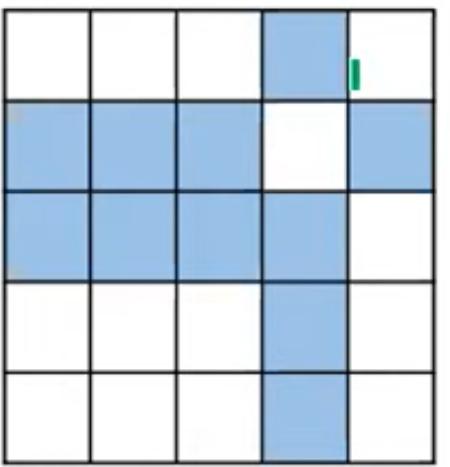
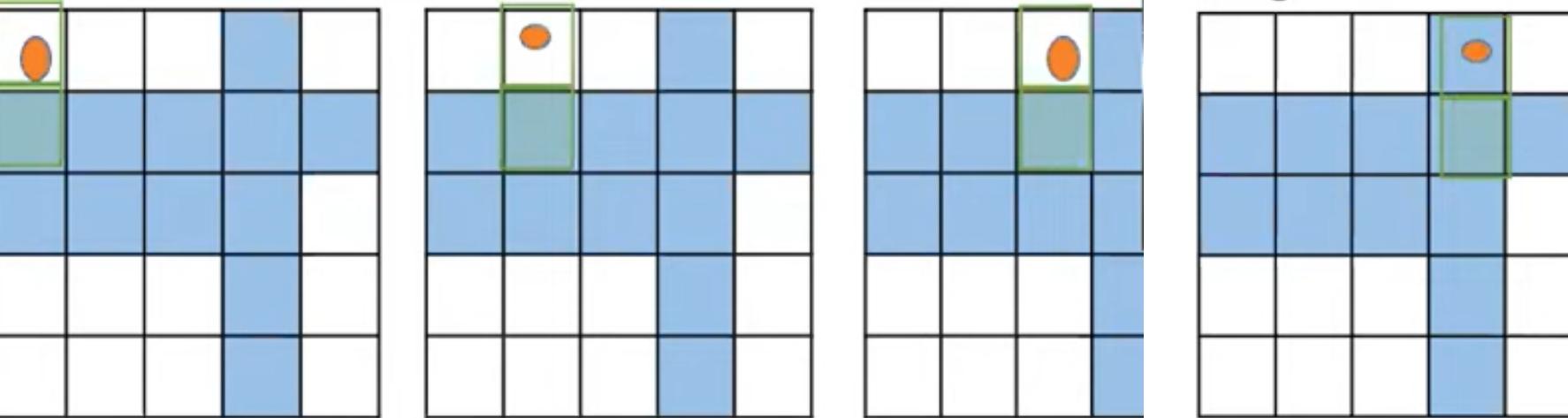
- The number of pixels removed or added from the objects in images depends on size and shape of the **structuring element** used to process the image.
- A shape mask used in the basic morphological operations.
- Can be any shape and size that is possible to present digitally and has an origin:



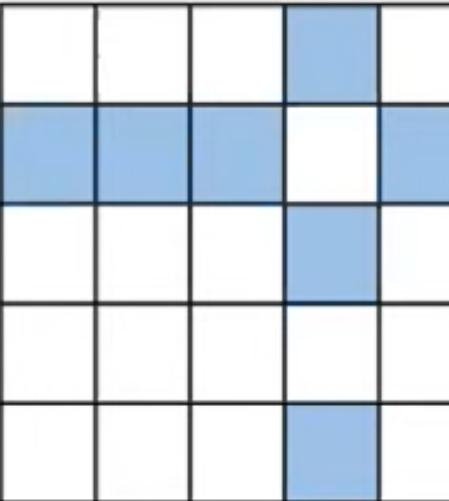
Erosion



origin
↓
Structuring element



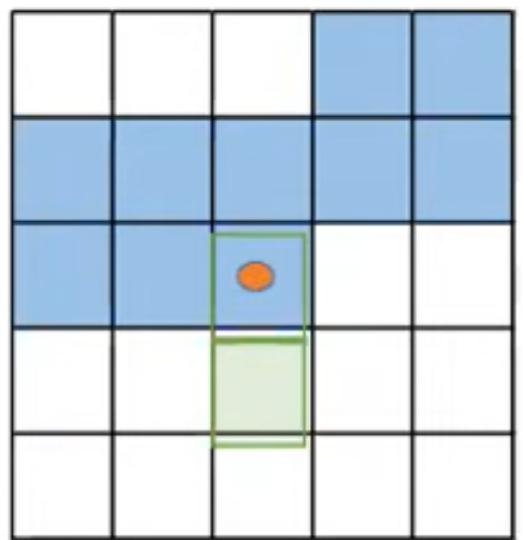
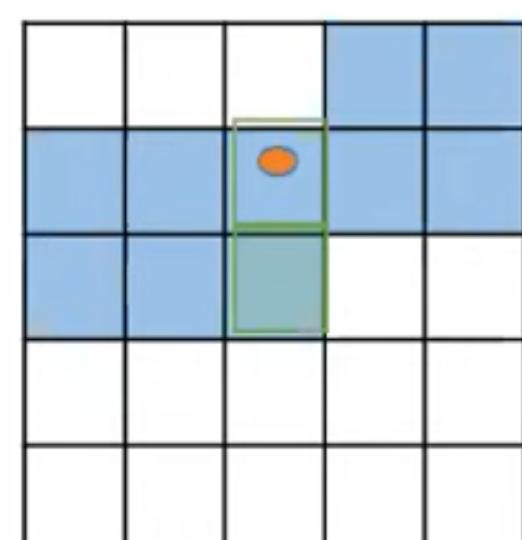
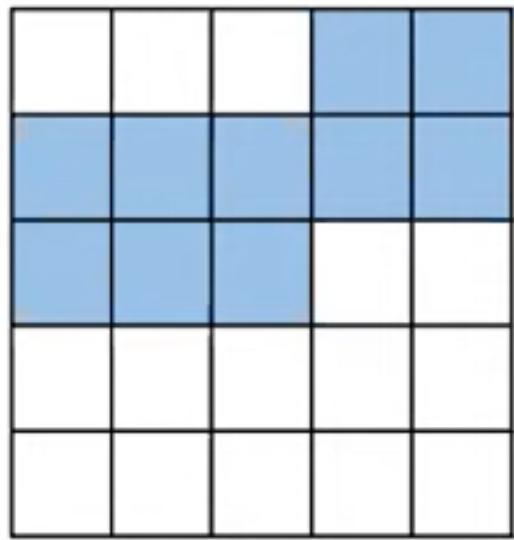
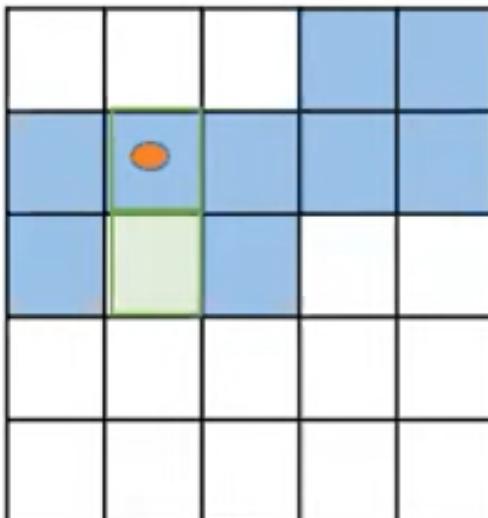
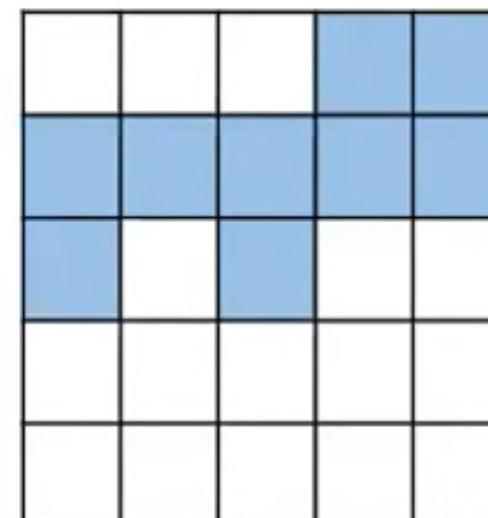
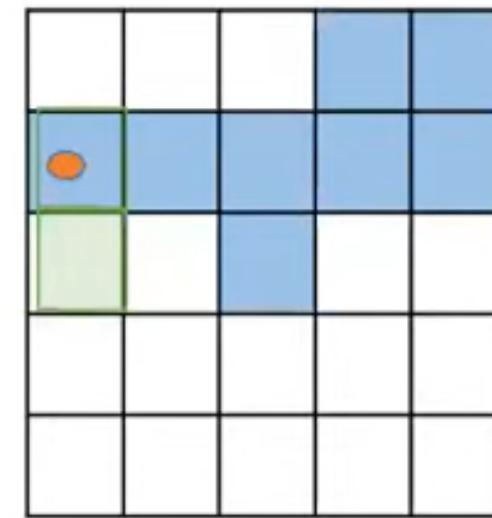
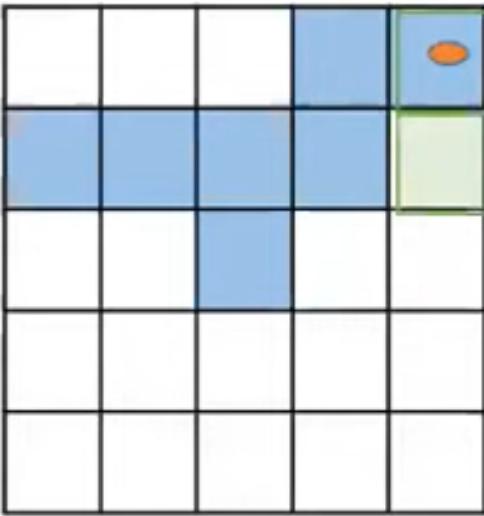
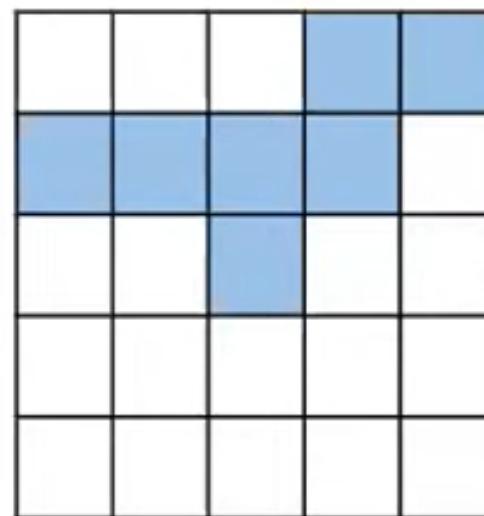
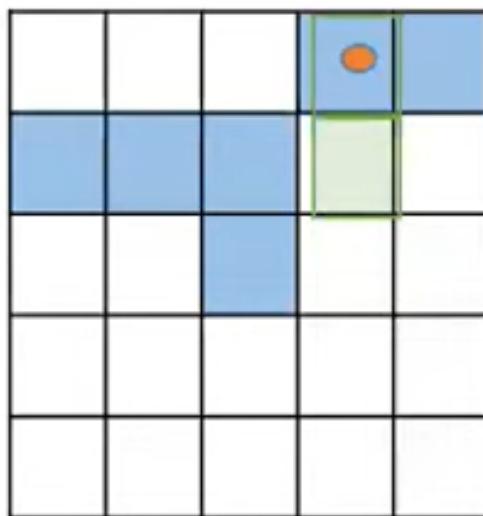
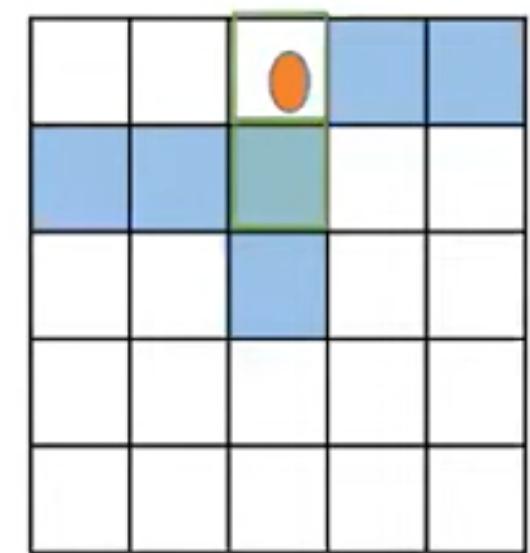
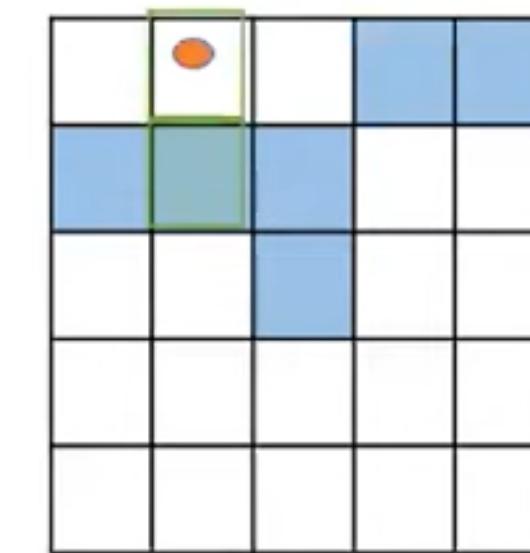
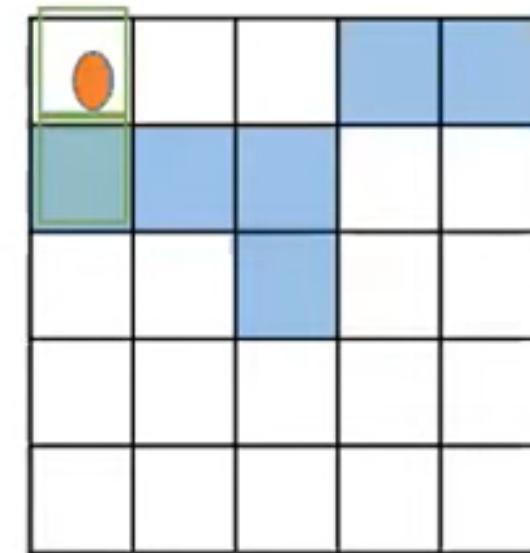
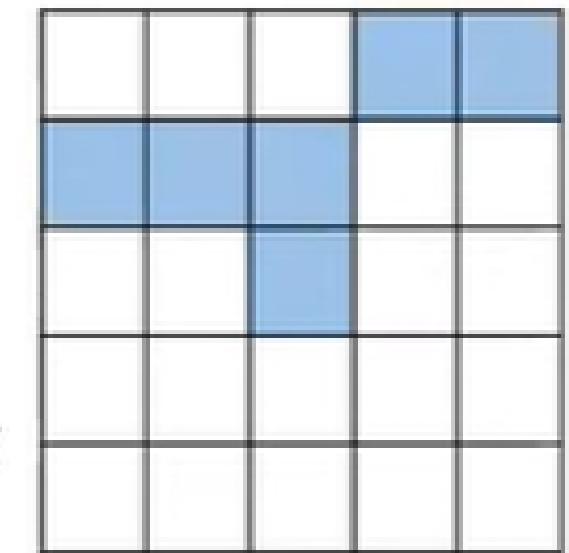
Final result:



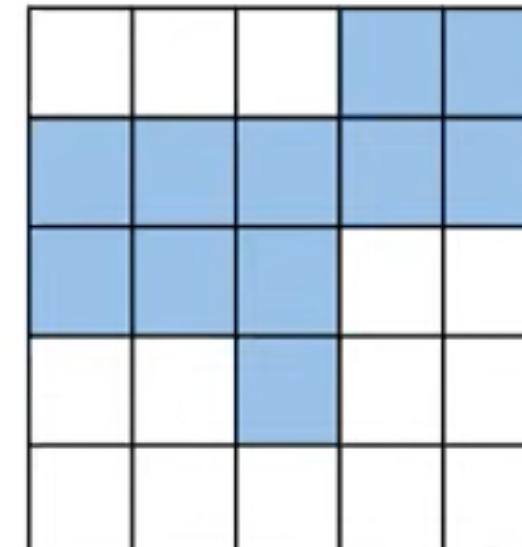
Dilation

0	0	0	1	1
1	1	1	0	0
0	0	1	0	0
0	0	0	0	0
0	0	0	0	0

origin
Structuring element



Final result:



Opening and Closing

Opening:

- Image---->Dilation---->Erosion
- Eliminates noise

Closing:

- Image---->Erosion---->Dilation
- Fill the gaps/ close gaps in objects

Opening and Closing perform same functions as Erosion and Dilation. However, during Opening and Closing process **the size of the object does not change.**



Started by GuldariyaBisenbay201938...

Meeting ID: 688 028 546

Start time: 2022/05/23 01:42:50

Created by: GuldariyaBisenbay2019380130花河

Erosion $A \ominus B = \{z | (B)_z \subseteq A\}$

Dilation $A \oplus B = \{z | (\hat{B})_z \cap A \neq \emptyset\}$

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

Closing $A \Psi B = (A \oplus B) \ominus B$

Boundary extraction $\beta(A) = A - (A \ominus B)$

**Thank you for your
attention!**