

MP2

In MP2, five functions are created to achieve basic morphological operations: erosion, dilation, opening, closing, and boundary.

Erosion:

The function is used to remove small details and noise from a binary image while still keeping the large features. The inputs of the function are the image and structuring element. The function uses the structuring element to scan through the image and examine the overlapped section. If all values in the overlapped sections are white, the output pixel at that position will be set to white. Otherwise, the output pixel at that position will be set to black.



The returned image should have a smaller white area. Because of the removing small details and noise, the output should be like a picture with scattered pixels but still contains the major feature of the original image. The output matches our expectation.

Dilation:

The function is used to enlarge the boundaries of the object shown on the image without damaging the overall shape. It can also be used to bridge gaps of some close features. The inputs of the function are the image and structuring element. The function scans through the image and sets pixels to white if the current scanned pixel is white and the pixel is covered by the structuring element.

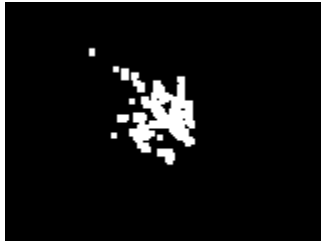


The returned image should have a larger white area. Some noise will be enlarged and the basic shape will be expanded. The gap inside the major feature should be closed. The output matches our expectation.

Opening:

This function combines an erosion operation followed by a dilation operation. The function is used to remove small details and noise from a binary image while still keeping the large

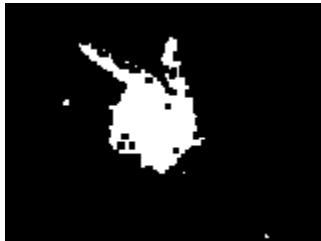
features. This function has a better performance than pure erosion because it can still have a large area of features from the processed image.



The returned image should look like an image after erosion operation but has an enlarged feature. The output matches our expectation.

Closing:

This function combines a dilation operation followed by an erosion operation. The function is used to fill small holes or gaps in an image while keeping the overall shape.



The returned image should look like an image after dilation operation but has less noise. The output matches our expectation.

Boundary:

This function is used to extract the edges of the features inside the image. The function uses an erosion operation and subtracts the output from the original image to generate the edge of the features.



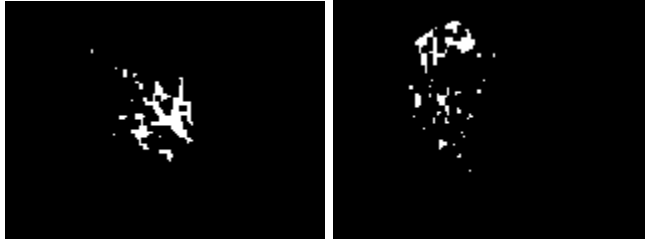
(based on closing output)

This output should show the edges of all the features. The output matches our expectation.

OUTPUT:

SE: 1 1 1
 1 1 1
 1 1 1

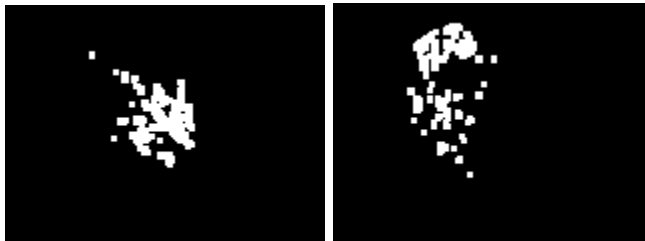
Erosion:



Dilation:



Opening:



Closing:

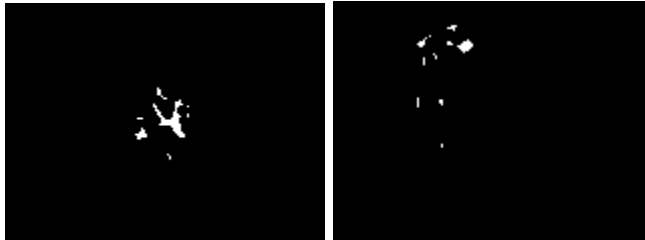


Boundary:



SE: 1 1 1
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
 1 1 1

Erosion:



Dilation:



Opening:



Closing:



Boundary:



By comparing two different structuring elements, we can see the first element works better at Erosion and Opening, and the second is better at Dilation, Closing, and Boundary.