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MP#1 - Morphological Operators

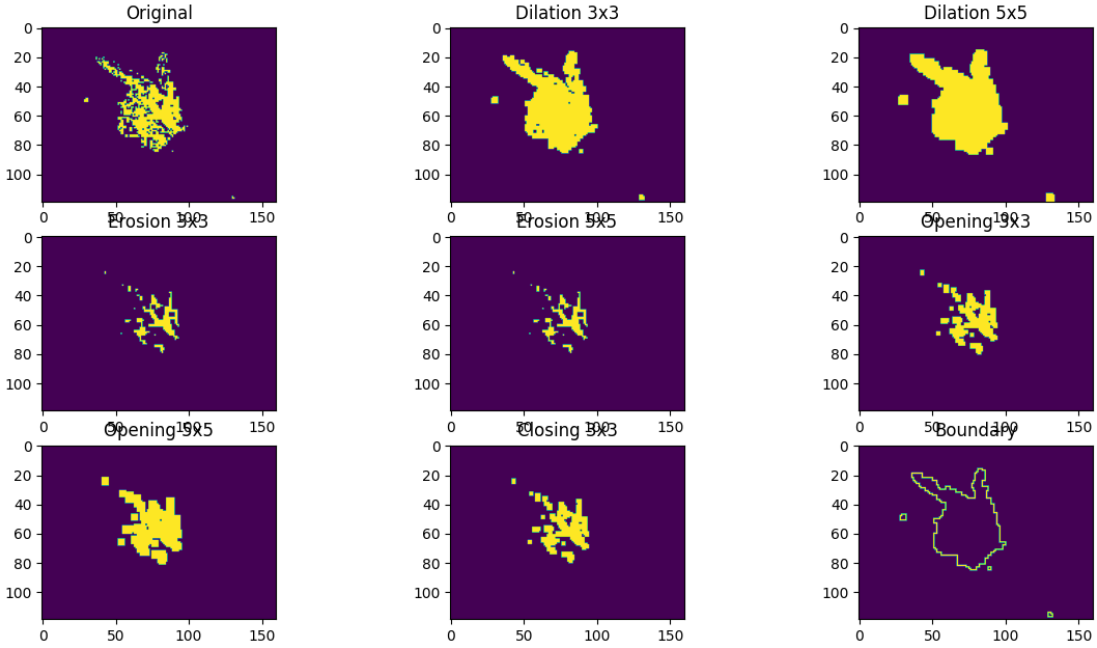
Description of Aglorithm

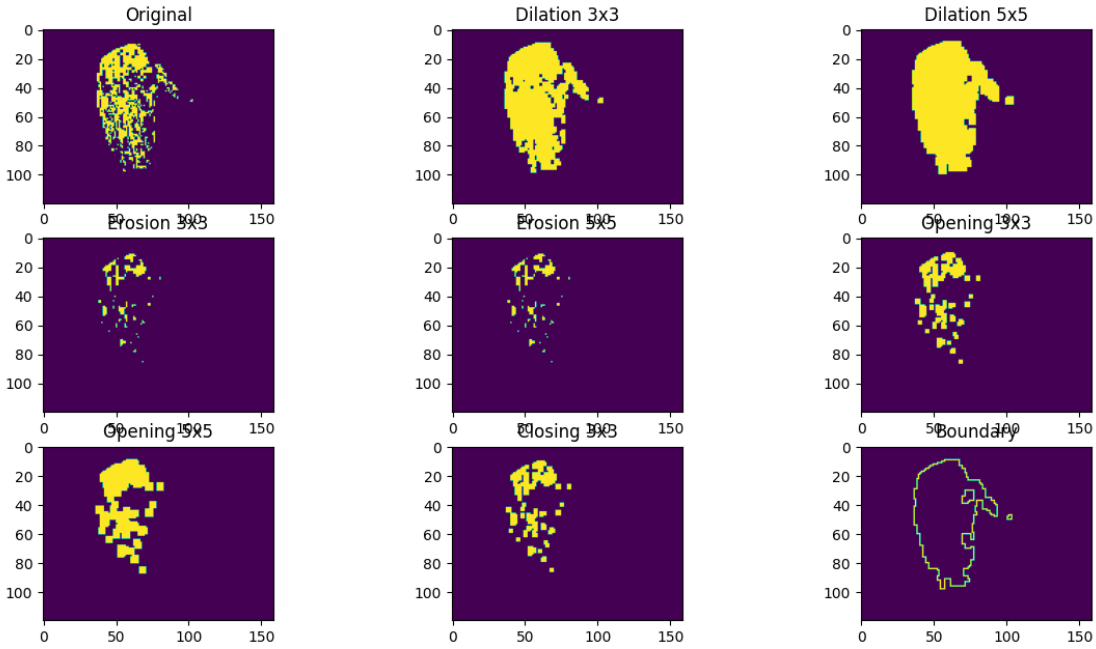
This algorithm consists of several functions that represent various morphological operations you can perform on an image. The primary functions are those of dilation and erosion. Dilation takes an image and structural element (SE) size as inputs, then creates a new image by populating a group of pixels of size SE centered at every coordinate corresponding to a foreground pixel from the original image. Erosion also takes an image and SE size as inputs, but then iterates through the image searching for clusters of pixels of size SE that are entirely foreground, and makes only their center pixel coordinate a foreground pixel in the new image.

The other morphological operator functions created in this algorithm utilize various combinations of dilation and erosion in order to accomplish different results. The opening operator consists of an erosion followed by a dilation. The closing operator consists of dilation followed by erosion. The boundary operator can be created in several different ways, each varying slightly in their results. In this algorithm, the method that seemed to produce the best results was to first perform the closing operation on the image, then subtract an eroded version of the closed image from the closed image itself. It is possible that other untested combinations may provide different results. Each operator provides unique functionality and may be more or less useful depending on the circumstance.

Results and Analysis

The results are displayed in two groups; one for each test image. These image clusters display the original image, two iterations of dilation (with both 3x3 and 5x5 structural elements), two iterations of erosion (with both 3x3 and 5x5 structural elements), two iterations of opening (with both 3x3 and 5x5 structural elements), one iteration of closing (due to space limitations), and one iteration of a boundary being created. The differences among the images showcase the variety of effects each choice of operation and structural element size can have on the final result.




Original
Dilation 3x3
Dilation 5x5
Erosion 3X3
Erosion 5X5
Opening 3X3
Opening 5X5
Closing 3X3
Boundary