NUECE 332 - Introduction to Computer Vision
Northwestern University
Fall 2021
Name: Soroush Shahi
NetID: SSF4323
E-Mail: soroush@u.northwestern.edu
GitHub-Repo: https://github.com/faderani/EE_332
GitHub-Name: faderani

MP#2 - Morphological Operators

1 Method

1.1 Dilation

Basically this operator is used to fill the gaps or connect regions of an image together. This algorithm will use a structuring element and visit every pixel on an image. If the value is equal to one then the surrounding pixels will be replaced by the structuring element.

1.2 Erosion

In contrast to Dilation, this operator is used to decrease the area of a region on an image. Like Dilation, this algorithm also uses a structuring element but this time removes the visited positive pixel if its neighbors do not match the SE.

1.3 Opening

This operator is defined as two steps. An erosion followed by a dilation.

1.4 Closing

Similarly, this operator is defined as two steps. First dilation is done and then an erosion is followed.

1.5 Boundary

In order to find the boundaries of an image, one way is to do an erosion operator so that the region gets smaller. Then this image is subtracted from the original image, therefore, only the boundaries of the region would remain.

(a) (b) (c)

Figure 1: Result of dilation and erosion operators

2 Results

In this section we show the result of each of these operators on one of the samples from the homework and we'll see how they help to remove the noises from an image. Figure 1a shows the original image. Figure 1b and 1c show the image after dilation and erosion operations are done. As seen, with dilation disconnected region on the image is connected to form the palm of the hand. Also note that in order to get this image, dilation was done multiple times. For erosion however, small regions were disappeared. Figure 2a and 2b show the effect of opening and closing operations. As seen, opening operation, opens the gap and closing operation closes them. Figure 2c shows the result of subtracting the original image after dilating the image. This operation, basically will result in the boundary of the image.

(a) (b) (c)

Figure 2: Result of opening, closing and boundary operations.