Guillermo Vargas

Lab 8

**Dilation**

1. *What would be the effect of a dilation using the cross-shaped structuring element shown in Figure 4?*

I get a dilation of the image edges that is equal in the x and y directions, so the dilation becomes very uniform.

**Erosion**

1. *What would be the effect of an erosion using the cross-shaped structuring element shown in Figure 4?*

The effect of an erosion element of this size, generates an erosion pattern that is also uniform in the x and y direction

1. *Is there any difference in the final result between applying a 3×3 square structuring element twice to an image, and applying a 5×5 square structuring element just once to the image? Which do you think would be faster and why?*

I believe that the difference would be not too large but the processing of a 5x5 element over an image would take longer than the 3x3 element because of the number of operations that will be executed.

1. *Use erosion in the way described above to detect the edges of. Is the result different to the one obtained with dilation?*

The result of the erosion here does work similar to dilation, especially for the bottom dark circle. The erosion occurs mostly in the outer edges of the white square.

**Opening**

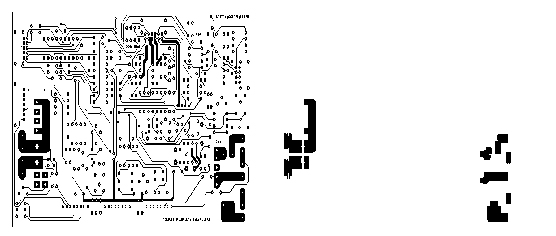
1. Compare the results obtained with the different sizes.

The results vary in that the larger the structuring element is, the more the opening operation effects the image. The depth at which the opening operation is done, also creates a larger effect.

1. The way I detect the small cells, and reject the larger ones, is applying a square element that would then expand in both x and y directions the elements. Then using MATLAB or an equivalent program, I would measure the radius of the remaining spots. Finally using an if statement I would reduce to zero all the spots that were above a certain size.

**Closing**

1. Remove the lines



1. Using closing to remove the features.
2. Remove the salt and pepper noise.

Dilation: 1 Erosion: 1, 2, 4 Opening: 1, 2 Closing: 1‐3 Thinning: 4 Thickening: 4