

TDT4195 - VISUAL COMPUTING FUNDAMENTALS

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# Image Processing - Assignment 3

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## 1 Task 1: Theory

a)

Opening is an erosion followed by a dialation, with the same structuring element. Can be written as

$$A \circ B = (A \theta B) \oplus B$$

Closing is a dialation followed by an erosion, with the same structuring element. Can be written as

$$A \bullet B = (A \oplus B) \theta B$$

Mutiple closing or multiple open operations will have no effect due to opening and closing being idempotent operations.

b)

Because edge detection enhances noise in the image, which makes it impossible to edge detect on a noisy image. Which is why we smooth/remove noise from an image before using edge detection.

c)

In hysteresis thresholding, there are two thresholds, a low and high threshold. Firstly all pixels above the high threshold gets set to one. Then it iterates over all pixels with value between the low and high threshold. If a pixel is connected to a pixel which has value above the higher threshold, it also gets set to one.

d)

We use hysteresis thresholding because it can remove non-edges from our image. With a single threshold values we get more fake edges because of such things as noise. However with hysteresis thresholding we only get the strong edges.

e)

Reflecting B has no effect so

which produces the dialated image

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

Table 1: Image produced after dialation

## 2 Task 2: Programming

a)

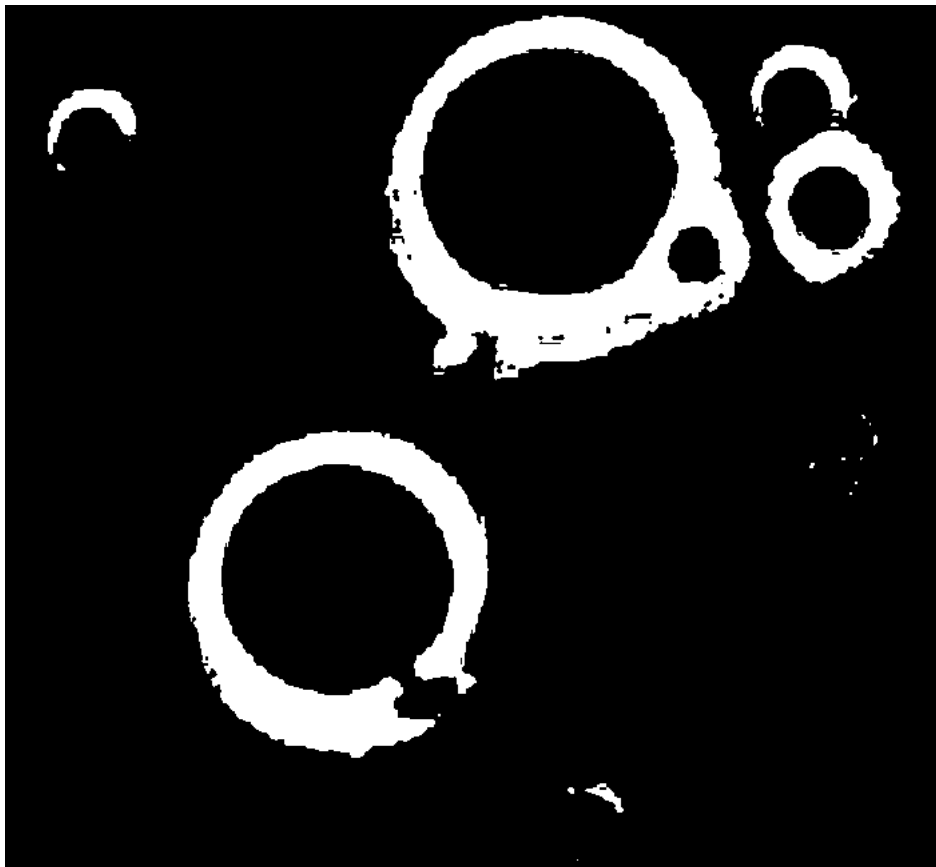


Figure 1: Segmented polymercell



Figure 2: Segmented thumbprint

b)

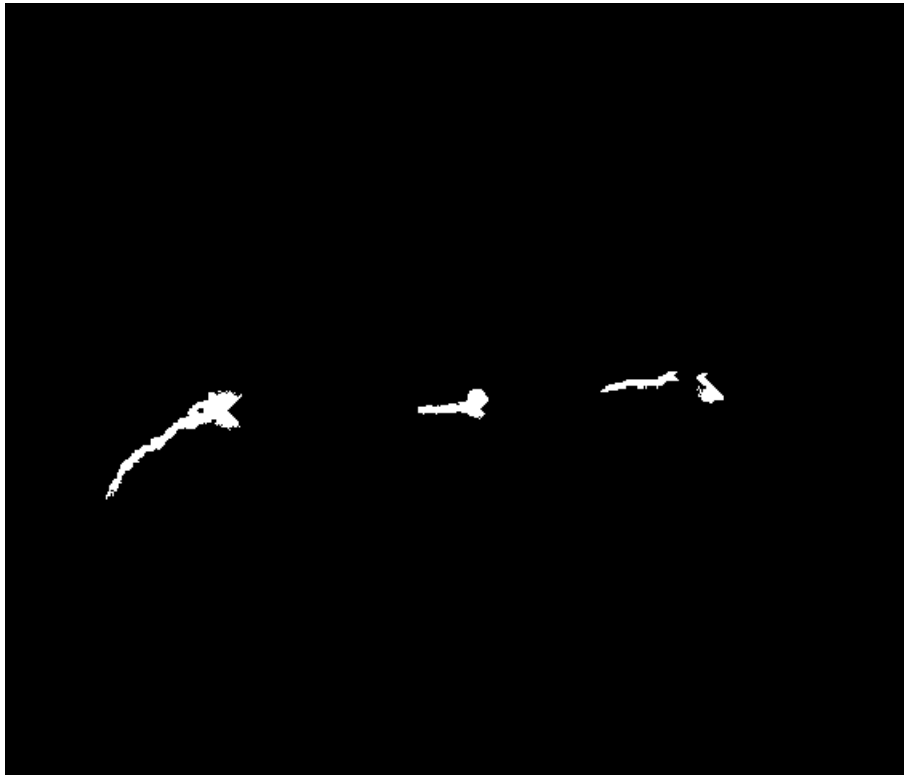


Figure 3: Segmented defective wel

### 3 Task 3: Morphology

a)

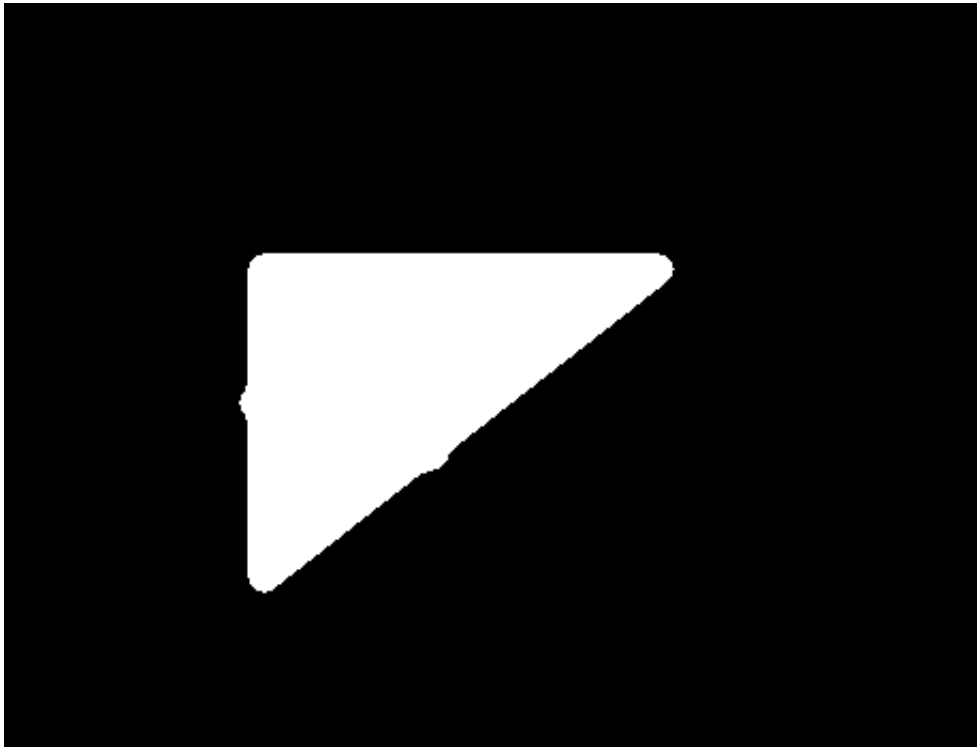


Figure 4: Noisy filtered

To remove the noise I firstly used opening then closing with a binary disk. To create the disk I used `skimage.morphology.disk` with a radius of 7. I iterated the radius until I found a disk which produced the image with the minimum amount of noise.

b)

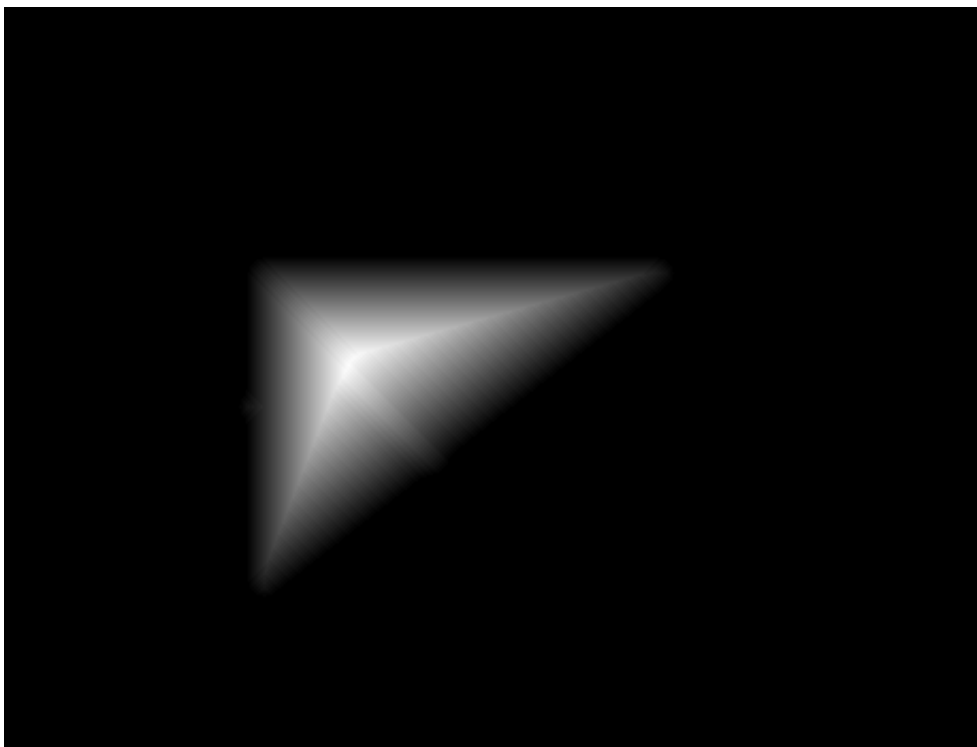


Figure 5: Noisy distance

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c)



Figure 6: Lincon boundary

d)

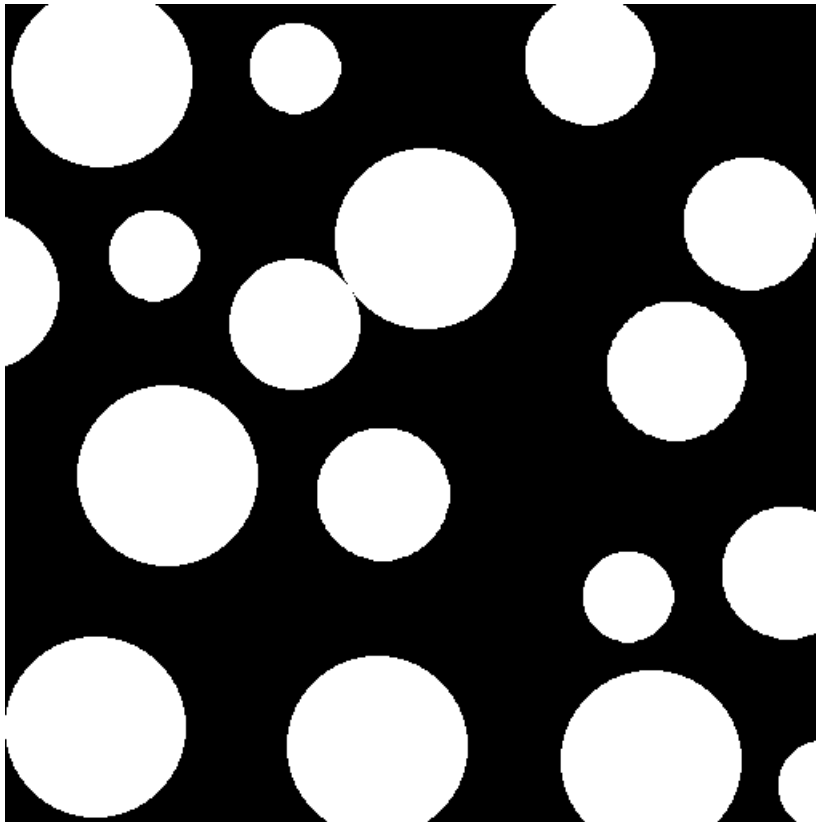


Figure 7: Filled in balls using algorithm 1