

## Image Processing Assignment 3

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### [Task 1]

- (a) Opening is the result of erosion applied by dilation. Closing is the result of dilation applied by erosion
- (b) To remove the noises that might affect edge detection.
- (c) There are two thresholds for hysteresis thresholding, one higher and one lower. Any pixel that is higher than the higher threshold is kept. Any pixel that is between the higher and the lower thresholds are also kept if the pixel is connected to any high pixels. The rest is discarded.
- (d) Two thresholds better ensure that no unclear edges are being removed. With a single threshold, too extreme (high or low) value can result in false negatives or false positives.

(e)

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

### [Task 2]

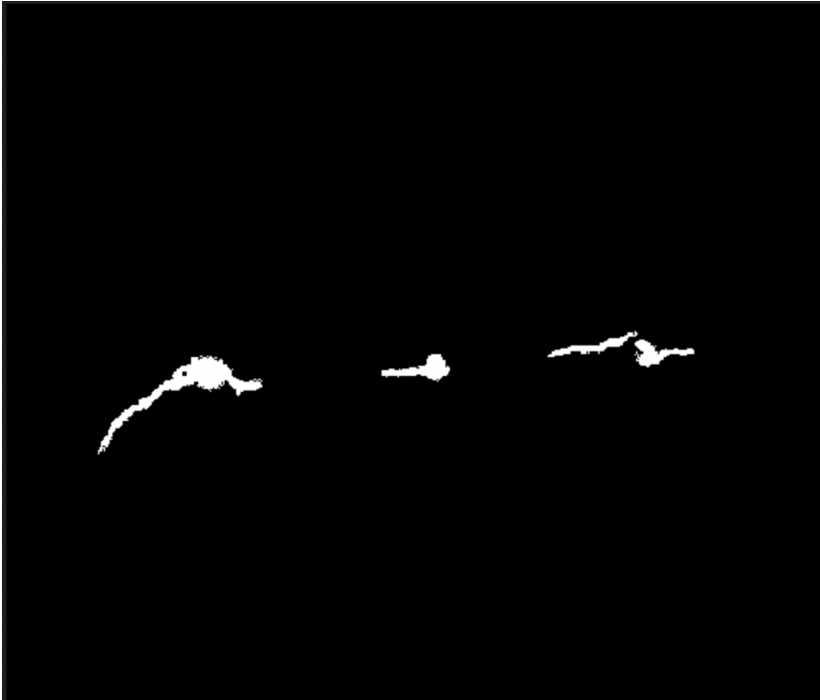
(a) Image outputs:



Threshold outputs:

```
Reading image: images/thumbprint.png  
Found optimal threshold: 153.103515625  
Reading image: images/polymercell.png  
Found optimal threshold: 181.720703125
```

(b)

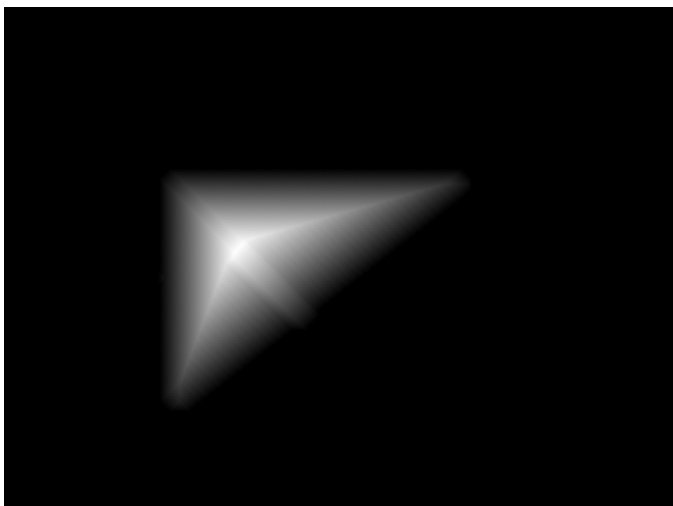


### [Task 3]

- (a) First, 2 erosions and 1 opening are used with a 5x5 square structuring element. Then, 3 dilations and 1 closing are used with a 5x7 octagon-shaped structuring element.



(b)



(c)



(d)

