TDT4195: Visual Computing Fundamentals

Image Processing – Assignment 3

Deadline: 22.11.2019

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Task 1

(a) Opening is defined as an erosion followed by a dilation, while closing is defined as a dilation followed by an erosion. In both opening and closing, the same structuring element needs to be used for both the erosion and the dilation. Repeated opening or closing on the same image with the same structuring element will yield no difference, as they are idempotent functions.

(b) Smoothing of an image is performed before edge detection to reduce the amount of noise in the image.

(c) Hysteresis thresholding works by setting two thresholds, one lower than the other. This let us retain areas above the lower threshold if it is connected to areas above the higher threshold.

(d) Hysteresis thresholding will leave less specks of white in the resulting image than the respective image created with a single threshold.
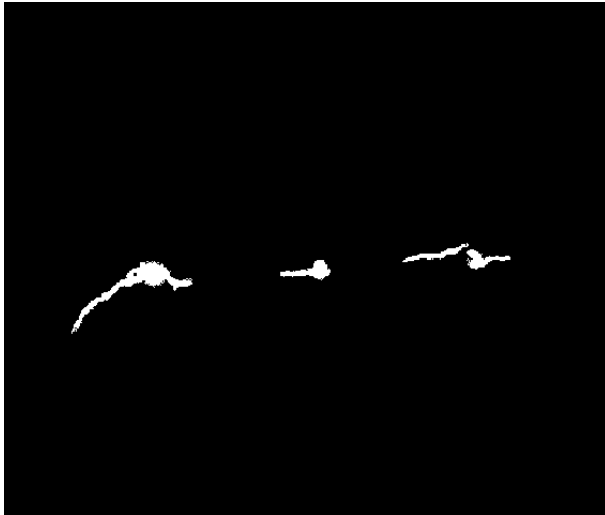
(e)
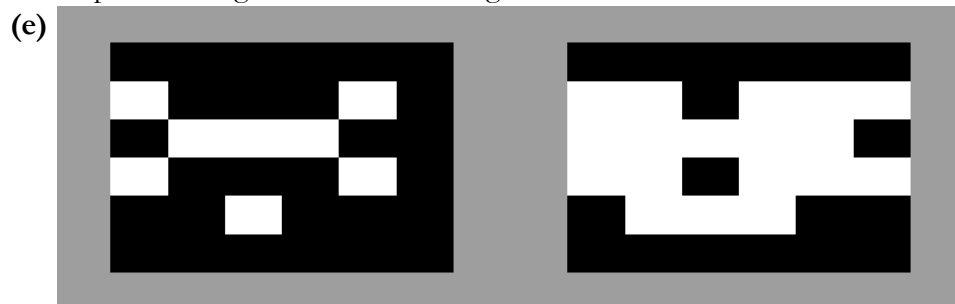
Task 2

a)

b)

Task 3

a) To remove the noise from the image, I started by performing opening with a disk-shaped structuring element of radius 7 (the lowest value that removed all unwanted white noise), as most of the noise was somewhat round. I then performed closing with a disk-shaped structuring element of radius 6 (again, the lowest value that would eliminate all the unwanted black noise).
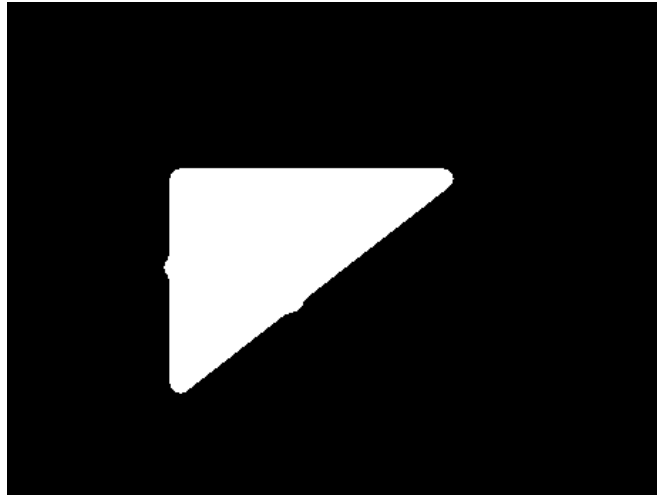
b)
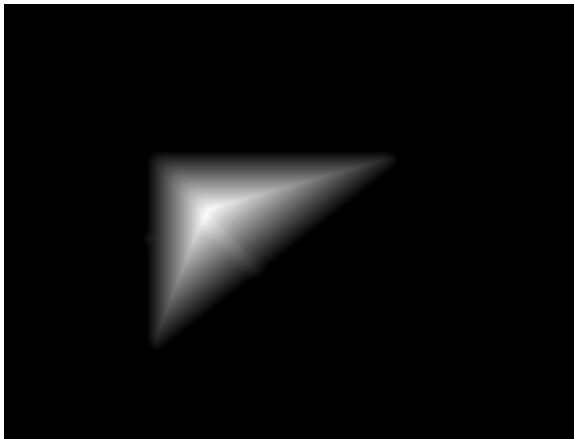
c) Extracting the outer boundary can be easily done by simply inverting the image before we use the formula:

$$A_{outer\ boundary} = A_{inverted} - (A_{inverted} \ominus B)$$

d)