

CSC317 Digital Image Processing Homework Assignment #3

1. Morphology – Exercise Problem #1 in our textbook

Find $A1 \ominus B1$; $A1 \oplus B1$; $A1 \odot B1$; and $A1 \bullet B1$ manually. Check the answers with OpenCV programming.

A1=

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

B1=

0	1	0
1	1	1
0	1	0

2. One application of morphology is Noise Removal. In our textbook, there is an image circles.png. You can add some noise to the image and then use morphology to remove the noise. Show the original image and the resulting image.

Hint: Add noise

```
import skimage.io as io
import numpy as np
c=io.imread('../OriginalImages/circles.png').astype('bool')*1
x=np.random.random_sample(c.shape)
c[np.nonzero(x>0.95)]= 0
c[np.nonzero(x<=0.05)] = 1
# Generate a kernel and perform morphology – you need to decide what operation to use below
```

3. Edge Detection – Apply Sobel X-Filter and Y-Filter to an image of your choice and demonstrate the effectiveness.
4. Write the lines $y = x - 4$, $y = 1 - \frac{x}{4}$ in (r, θ) form using the Hough Transform described in Section 9.11 or Class Note#11.

Submission Instructions

1. Submit two files for each homework: (1) A Word document showing answers to all questions including math-related questions and programming-related questions. (2) A compressed file

containing the programs you used with the name HW#1-LastName-FirstName.zip. This will help grading a lot. DO NOT INCLUDE THE WORD DOCUMENT IN THE COMPRESSED FILE. NAME YOUR COMPRESSED FILE WITH THE NAMING RULE MENTIONED.

2. When you submit a math problem, you can submit a photo of a hand-written note, word document, text, etc., as long as the procedure of deriving the result is included. You don't want to submit just the results.
3. When you submit a programming-related problem, you need to submit the executable python code either in a compressed folder or as individual python files, e.g., ".py" files. Without the source code, I cannot judge the soundness of your solution. I will have to deduct points depending on severity.
4. Late penalty will begin to impose after the deadline. The late penalty is -10/100 per day late including weekends.
5. For Math-related problems, you need to include the procedure to show how the results are derived. If you simply write down the answers, your solution is incomplete and you will receive penalty of at least 50% of the grade for that question if your answer is correct. If your answer is wrong, you will receive nothing for that question. There will be no way to assign a partial credit.