

## HOMEWORK ASSIGNMENT #3

### Morphological Processing, Texture Analysis

**Due Date: 11:59am on 04/10/2019**

Please read the submission guideline carefully before getting started. All images in this homework can be downloaded from our class website: [https://ceiba.ntu.edu.tw/1072\\_DIP](https://ceiba.ntu.edu.tw/1072_DIP). Images are in the raw file format. The size of each image is listed in the appendix.

For MATLAB users, you are **NOT** allowed to use the MATLAB Image Processing toolbox except the `imshow()` and `image()` functions.

#### PROBLEM 1: MORPHOLOGICAL PROCESSING

Given a binary image  $I_1$  as shown in Fig. 1. Please follow the instructions below to create several new images along with discussions about the results.

- Perform boundary extraction on  $I_1$  to extract the objects' boundaries and output the result as an image  $B$ .
- Perform connected component labeling on  $I_1$  to obtain an image  $C$  where different objects are labeled with different colors.
- Perform thinning and skeletonizing on  $I_1$  and output the results as image  $D_1$  and  $D_2$ .

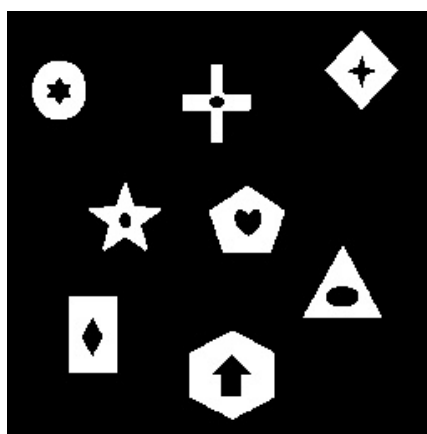


Fig. 1: sample1.raw

#### PROBLEM 2: TEXTURE ANALYSIS

As shown in Fig. 2, image  $I_2$  is composed of several different textures.

- Perform Law's method on  $I_2$  to obtain the feature vector of each pixel.
- Use k-means to classify each pixel and label same kind of texture with same gray-level intensity. Please output the result as  $E$ .

- (c) Based on E, try to generate another texture image by exchanging the types of different texture patterns. Please output the result as G.

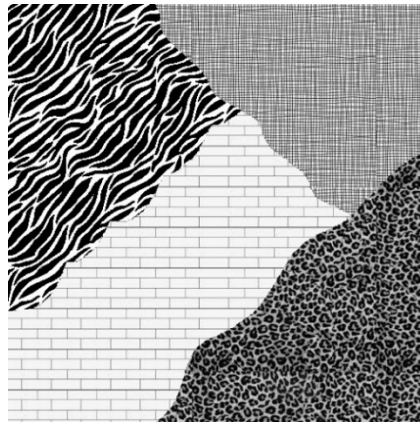


Fig. 2: sample2.raw

### [Bonus]

Fig. 3 shows a gray-level image  $I_3$ . Please design an algorithm to count the number of berries in the image. Please describe the proposed method in detail.

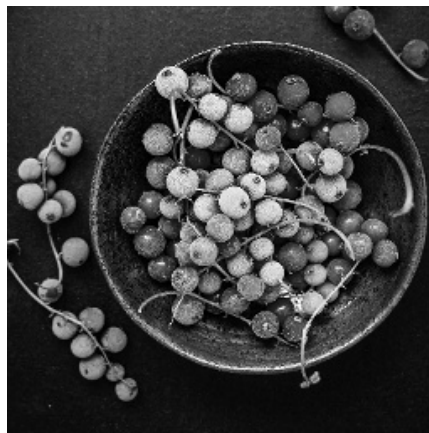


Fig. 3 sample 3.raw

### Appendix:

#### Problem1: MORPHOLOGICAL PROCESSING

sample1.raw	Fig. 1	256×256 image	binary
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#### Problem2: TEXTURE ANALYSIS

sample2.raw	Fig. 2	512×512 image	gray-scale
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#### Bonus

sample3.raw	Fig. 3	256×256 image	gray-scale
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