HOMEWORK ASSIGNMENT #3

Morphological Processing, Texture Analysis

Due Date: 11:59am on 05/02/2018

Please read the submission guideline (posted on the class website) carefully before getting started.

All images in this homework can be downloaded from our class website:

https://ceiba.ntu.edu.tw/1062DIP. 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. White pixels represent the objects and black pixels represent the background. Please follow the instructions below to create several new images and describe the method in detail for each case.

(a) Perform boundary extraction on I_1 to extract the objects' boundaries and output the result as image B. Please provide some discussions about image B.

(b) Please design an algorithm to count the number of objects in I_1 based on morphological processing.

(c) Perform skeletonizing on I_1 and output the result as image S. Please provide some discussions about image S.
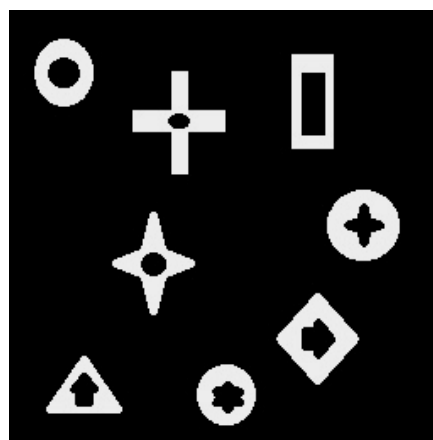

Fig. 1 sample1.raw

PROBLEM 2: Texture Analysis

An image I_2 which is composed of several different textures is given in Fig. 2.

(a) Perform Law's method on I_2 to segment the image into 3 different texture groups. Label the pixels of the same texture group with same intensity values. Please detail the method you choose, specify all the parameters and output the result as K.

(b) Based on K, try to generate another texture image by exchange the types of different texture patterns.

Fig. 2: sample 2.raw

[Bonus]

Given an image I_3 shown in Fig. 3, please try to produce an image as illustrated in Fig. 4 by adopting appropriate morphological processing. Please describe the designed algorithm in detail and provide some discussions.
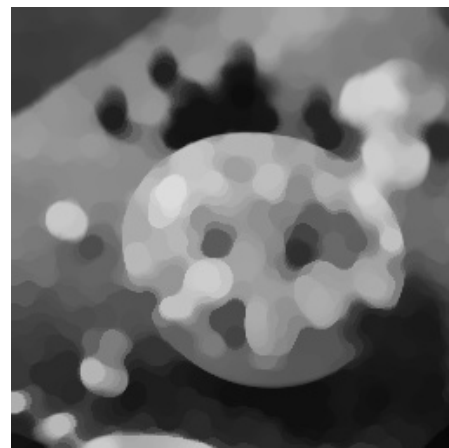

Fig. 3: sample 3.raw

Fig. 4: The desired image

Appendix:

Problem1: Morphological Processing

sample1.raw   Fig. 1   256 x 256 image   binary

Problem2: Texture Analysis

sample2.raw   Fig. 2   512 x 512 image   gray-scale

Bonus

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