Digital Image Processing (Handout 4) (10/31/2013)

HOMEWORK ASSIGNMENT #3

Morphological Processing & Texture Analysis

Due Date: 9:00pm on 11/13/2013

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/1021DIP.* 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

In this problem, you are given a binary image I as shown in Fig. 1. Please follow the instructions below:

(a) Design a morphological process to extract the objects' boundaries and output the result as an image M.

(b) Perform connected component labeling on I to obtain an image L where different objects are labeled with different colors.

(c) Please design an algorithm based on the morphological operators you learned in class to count the number of circles in image I. Please detail how you solve the overlapping problem.

Please provide your results and discussions in the report.

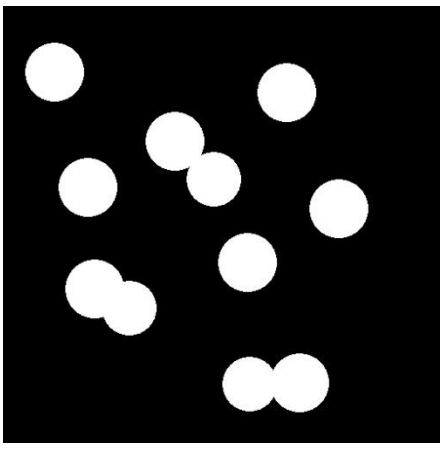

Fig.1 circle.raw

PROBLEM 2: TEXTURE CLASSIFICATION

The sample images of size 64x64 displayed in Fig 2 are given for this task. Please write a program to categorize them into 4 different types. First, compute the feature of each sample using Law's method. Then, classify them into different types according to the Law's features. Please show the classification results in your report and discuss whether the results are correct or not. Notice that it is required to describe the classification algorithm you used in detail.

Fig.2 sample[01~16].raw

PROBLEM 3: TEXTURE SEGMENTATION

In this problem, you are given a gray-level image I which is composed of several different textures.

(a) Perform Law's method on I to obtain the feature vector of each pixel.
(b) Use k-means algorithm to classify image pixels.
(c) Label same kind of texture with same gray-level intensity and output the result as L.
(d) If a wrong k is given in step (b), what will happen? Can you design a method to determine k automatically?

Please provide the results and discussions for each part in your report.

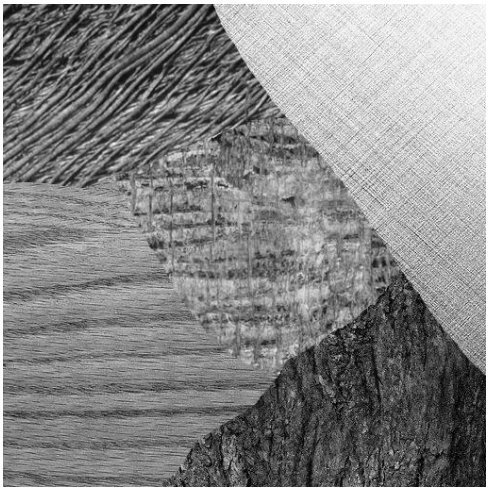

Fig.3 texture_gray.raw

Appendix: Image files

PROBLEM 1: MORPHOLOGICAL PROCESSING

circle.raw	Fig.1	512 x 512 image	gray-scale

PROBLEM 2: TEXTURE CLASSIFICATION

sample[01~16].raw	Fig.2	64 x 64 image	gray-scale

PROBLEM 3: TEXTURE SEGMENTATION

texture_gray.raw	Fig.3	512 x 512 image	gray-scale