Digital Image Processing (Handout 5) (11/21/2013)

HOMEWORK ASSIGNMENT #4

Discrete Fourier Transform

and Shape-Based Pattern Reorganization

Due Date: 9:00pm on 12/4/2013

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: Discrete Fourier Transform (DFT)

In this problem, you are given an original image I, as shown in Fig. 1. Please follow the instructions below to create several images.

(a) Write the DFT subroutine (with origin shifted) and perform it on image I. Show the output as F1 with log transformation and output the execution time.

(b) Explain the phenomenon of the result in (a). Provide some discussions on the results. What happens if the origin is not shifted?

(c) Write the IDFT (Inverse DFT) subroutine and perform it on F1. Output the result as F2 and justify your result and show the execution time.

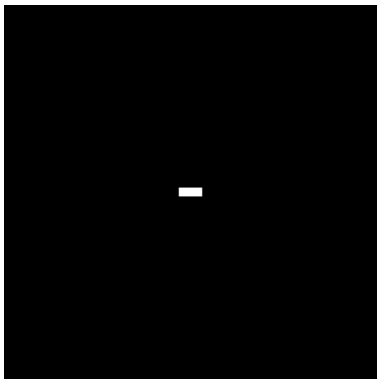

Fig. 1 rectangle.raw

PROBLEM 2: CAPTCHA

In this problem, please design an algorithm to recognize CAPTCHA. The image captcha.raw contains four types of CAPTCHA. Since different CAPTCHAs are supposed to be solved in different ways, you only need to select one of them to test your algorithm. The training set is given in Fig. 3. Please provide the flow chart of your algorithm, and discuss your design in the report.

Fig. 2 captcha.raw

Fig. 3 training.raw

PROBLEM 3: BONUS

Remember that you were asked to provide one image of yourself at the beginning of the semester? Please enhance the image quality or add certain special effect in any way you prefer but NOT just using single method you learned from class. Describe your method step by step and explain the reason why you design it in such way. In case that the image is of *.jpg or other formats, you can use OpenCV or any software to convert it to *.raw and save it as “selfportrait.raw.” Then the new image file “selfportrait.raw” will be the input to your own program.

Appendix: Image file

rectangle.raw	Fig. 1	256 x 256 image	gray-scale
captcha.raw	Fig. 2	256 x 256 image	gray-scale
training.raw	Fig. 3	450 x 248 image	gray-scale