Digital Image Processing (03/28/2018)

# HOMEWORK ASSIGNMENT #2

## Edge Detection, Geometrical Modification

**Due Date: 11:59am on 04/11/2018**

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: EDGE DETECTION

(a) Given an image $I_1$ as show in Fig. 1(a), please perform 1st order edge detection, 2nd order edge detection, and Canny edge detection to obtain corresponding edge maps. Please describe each method in detail, specify each parameter clearly and discuss how each of them affects the resultant edge map. What are pros and cons of each method? [Please output the edge points with intensity value 1 and background points with intensity value 0.]

(b) Given an image $I_2$ with periodic noise as shown in Fig. 1(b), please design your own method to generate the edge map by avoiding obtaining edges of the noise. [Please output the edge points with intensity value 1 and background points with intensity value 0.]

Fig.1(a): sample1.raw

Fig.1(b): sample2.raw

## PROBLEM 2: GEOMETRICAL MODIFICATION

Given an image $I_3$ as shown in Fig. 2(a).

(a) Please perform edge crispening on $I_3$ and denote the result as C. Show the parameters adopted and provide some discussions on the result as well.

(b) Please design a warping function to convert the image C to image D with a shape similar to Fig. 2(b).

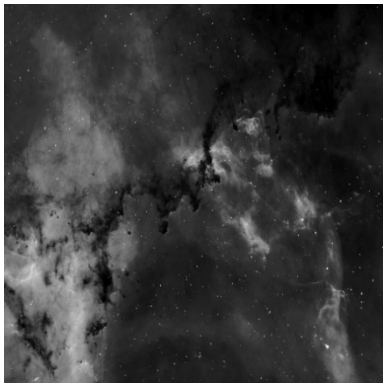

Fig.2(a): sample3.raw

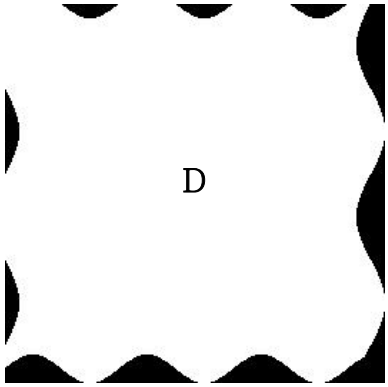


Fig.2(b): warped image

## [Bonus]

Please design an algorithm to enhance the following two images as best as you can. The top 10% students will get the extra credit.

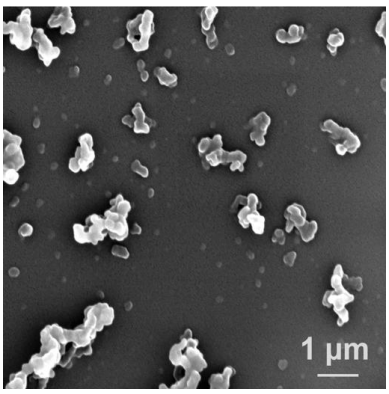


Fig.3(a): sample4.raw

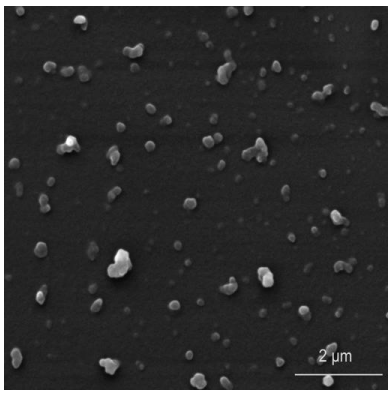


Fig.3(b): sample5.raw

## Appendix:

*Image files*

**Problem1: EDGE DETECTION**

| | | | |
|---|---|---|---|
| sample1.raw | Fig.1(a) | 512 x 512 image | gray-scale |
| sample2.raw | Fig.1(b) | 512 x 512 image | gray-scale |

**Problem2: GEOMETRICAL MODIFICATION**

| | | | |
|---|---|---|---|
| sample3.raw | Fig.2(a) | 512 x 512 image | gray-scale |

**[Bonus]**

| | | | |
|---|---|---|---|
| Sample4.raw | Fig.3(a) | 512 x 512 image | gray-scale |
| Sample5.raw | Fig.3(b) | 512 x 512 image | gray-scale |