HOMEWORK ASSIGNMENT 2

Edge Detection, Geometrical Modification

Due Date : 11:59 am on 04.15.2020
Please read the **submission guideline** carefully before getting started. All images in this homework are in JPEG format and can be downloaded from our `NTU COOL` website. Details of all files offered are listed in the appendix. You are **NOT** allowed to use other functions except I/O, plotting and basic functions.

Problem 1: EDGE DETECTION

In this problem, please design several edge detection algorithms to satisfy the following requirements.

a (`25 pt`) Please perform 1^{st} order edge detection, 2^{nd} order edge detection and Canny edge detection on **sample1.jpg**, and output the edge maps as **result1.jpg**, **result2.jpg** and **result3.jpg**, respectively. Provide some discussions about those methods. For example, what are their pros and cons, how do they perform on different textures in the image, how do parameters affect the results, etc. Please mark the edge pixels with intensity 255 and backgrounds pixels with intensity 0 on your results.

b (`25 pt`) First, please design an edge crispening method, apply it to the given image, **sample2.jpg**, and save the result as **result4.jpg**. Second, compare the edge maps you obtained from images **sample2.jpg** and **result4.jpg**. Provide some discussions and findings in the report.

(a) sample1.jpg

(b) sample2.jpg

Figure 1: Images for edge detection.

Problem 2: GEOMETRICAL MODIFICATION

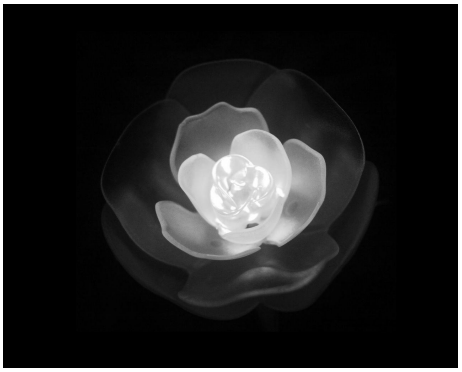
In this problem, please design several geometrical modification algorithms to meet the following requirements.

a (`25 pt`) Given **sample3.jpg**, design an algorithm to make **sample3.jpg** become **sample4.jpg**. Output the result as **result5.jpg**. Please describe your method and implementation details clearly.

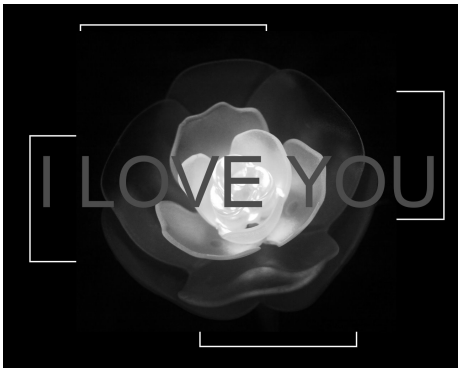
b (`25 pt`) Considering the shape of sine wave, please design a method to make **sample5.jpg** look like **sample6.jpg** as close as possible and save the output as **result6.jpg**.

Please describe your method and implementation in detail and also provide some discussions about the designed method, the result, and the difference between **result6.jpg** and **sample6.jpg**, etc.

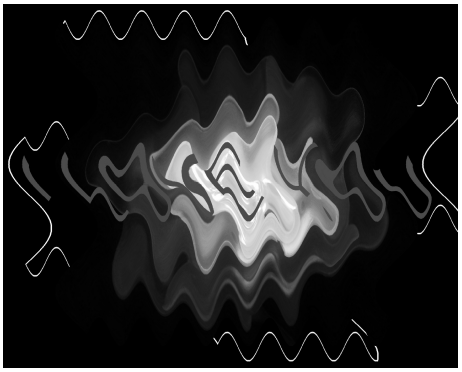
(a) sample3.jpg



(b) sample4.jpg



(c) sample5.jpg

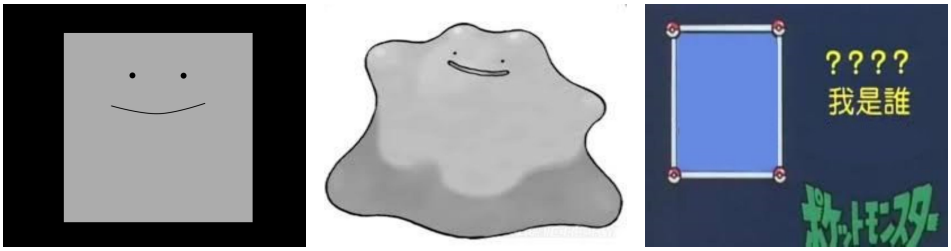


(d) sample6.jpg

Figure 2: Images for geometrical modification.

BONUS

(20 pt) Given and image **sample7.jpg** as shown in Fig. 3(a) , try your best to warp it to the shape of **sample8.jpg**, and put the result in the bounding box of **sample9.jpg**. You may use any method to put your result in the bounding box, including Photoshop, PhotoImpact, Paint, etc. or you may complete it with your own program. However, you can only warp **sample7.jpg** to **sample8.jpg** with your designed algorithm. The better warping you can perform, a higher score you can obtain. Name the final output as **result7.jpg** along with the descriptions about your method and implementation.



(a) sample7.jpg (b) sample8.jpg (c) sample9.jpg

Figure 3: Images for BONUS.

Appendix

Image Files:

1. sample1.jpg: 1200×1650
2. sample2.jpg: 1200×1650
3. sample3.jpg: 1024×1280
4. sample5.jpg: 1024×1280
5. sample7.jpg: 1024×1280
6. sample8.jpg: 1024×1280
7. sample9.jpg: 1024×1280