HOMEWORK ASSIGNMENT 2

Edge Detection, Geometrical Modification

Due Date: 11:59 pm on Apr. 07, 2021
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) sample1.jpg

(b) sample2.jpg

Figure 1: Images for edge detection.

(a) (`30 pt`) Given an image, **sample1.jpg**.

(1) Perform 1^{st} order edge detection and output the edge maps as **result1.jpg**

(2) Perform 2^{nd} order edge detection and output the edge maps as **result2.jpg**

(3) Perform Canny edge detection and output the edge maps as **result3.jpg**

(4) Apply an edge crispening method to the given image, and output the result as **result4.jpg**. Please also generate an edge map of **result4.jpg** as **result5.jpg**.

(5) Compare **result1.jpg**, **result2.jpg**, **result3.jpg** and **result5.jpg**. Provide some discussions and findings in the report.

Provide some discussions about those methods. For example, their pros and cons, how parameters affect the results, etc. Please mark the edge pixels with intensity 255 and backgrounds pixels with intensity 0 on your results.

(b) (`20 pt`) Please design an algorithm to obtain the edge map of **sample2.jpg** as best as you can. Describe the steps in detail and provide some discussions.

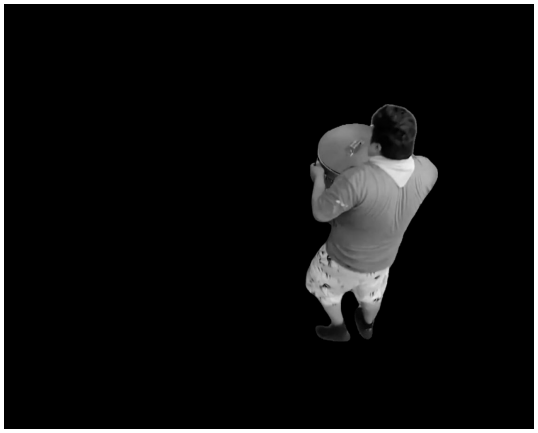
Problem 2: GEOMETRICAL MODIFICATION

In this problem, please design several geometrical modification algorithms to meet the following requirements. Your results don't have to be exactly the same as sample images, just try to make the effects.

(a) (25 pt) Please design an algorithm to make **sample3.jpg** become **sample4.jpg**. Output the result as **result6.jpg**. Please describe your method and implementation details clearly. (hint: you may perform rotation, scaling, translation, etc.)

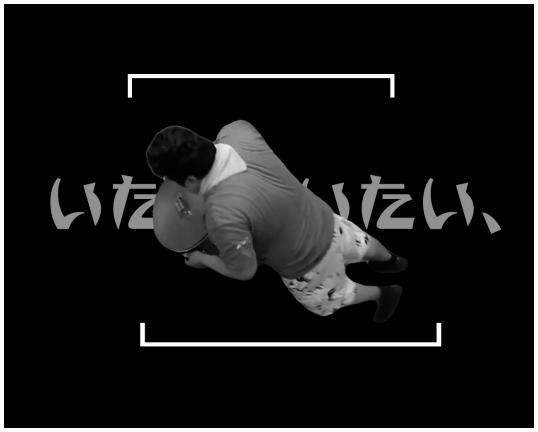
(b) (25 pt) Imagine that there is a black hole in the center absorbing **sample5.jpg**. Please design a method to make **sample5.jpg** look like **sample6.jpg** as much as possible and save the output as **result7.jpg**.

Please describe your method and implementation in detail and also provide some discussions about the designed method, the result, and the difference between **result7.jpg** and **sample6.jpg**, etc.

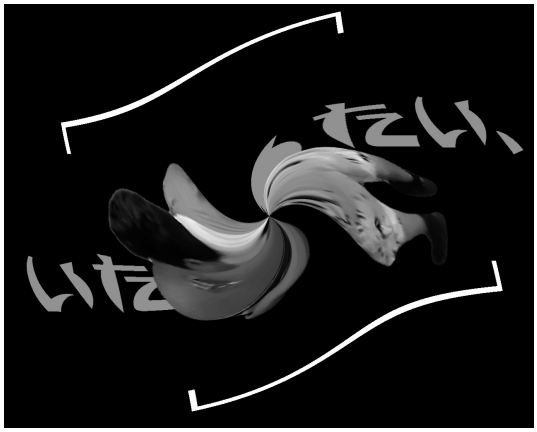


(a) sample3.jpg

(b) sample4.jpg



(c) sample5.jpg



(d) sample6.jpg

Figure 2: Images for geometrical modification.

Appendix

Problem 1: EDGE DETECTION

sample1.jpg:	1200×1650	gray-scale
sample2.jpg:	1200×1650	gray-scale

Problem 2: GEOMETRICAL MODIFICATION

sample3.jpg:	1024×1280	gray-scale
sample5.jpg:	1024×1280	gray-scale