MT Assignment 1 Report

Image Composition

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Setup

Components

There are:

- 5 folders: my_src1, my_src2, output, src, tmp
- 7 files: img_comp.m, img_comp.mlx, my_comp1.m, my_comp1.mlx, my_comp2.m, my_comp2.mlx, MT-hw1.pdf

in this assignment folder.

- **my_src1**: This folder has **2 raw images** for my free play part (part2) of the assignment
- **my_src2**: This folder also has **2 raw images** for my free play part (part3) of the assignment
- **output**: All the image composition output images will be in this folder. After the execution, it should have **3 images**. One for assignment requirement other two for free play part.
- **src**: This folder has **3 images** from the assignment I downloaded from the course website.
- **tmp**: This folder will only have one image which is the temporary image generates from composing **"pond.bmp" and "wave.bmp"**
- **img_comp.m, img_comp.mlx**
  This is the code for the first part of the assignment. Using **Matlab** to execute this program and get the output image in **"./output/sample.bmp"**
- **my_comp1.m, my_comp1.mlx**
  This is the code for the second part of the assignment (my first free try image composition). Using **Matlab** to execute this program and get the output image in **"./output/my_composition_1.bmp"**
- **my_comp2.m, my_comp2.mlx**
  This is the code for the third part of the assignment (my second free try image composition). Using **Matlab** to execute this program and get the output image in **"./output/my_composition_2.bmp"**.
- **MT-hw1.pdf**: This report.

Method Description

I split this assignment into 3 parts: 1 for assignment require image composition and 2 for free play.

Part1: Compose 3 images to 1 output image

I first compose **"wave.bmp"** and **"pond.bmp"** and then compose with the **"lion.bmp"**. Doing this is because at this point I can reduce the discreteness of pixel with that has a black margin with different threshold values.

1. Read in the pond and the wave and construct the matrix

    a. Open image folder
    b. Read in the image and format each to a vector size of 1003230
    c. Concatenate all the vectors to a matrix 1003230x2
    d. If the pixel value of **the wave image is less than 0.095 (threshold) then I repace with 0**
2. Calculate the weighted mean as the output image
    a. Define the weight vector -> [1, 2.5]
    b. Using the image vector and the weight vector to do matrix multiplication
    c. Sum up the weights
    d. If the value of the wave image is 0 in this pixel then it will all be represented with the pond image
    e. If not then divided by the sum of the weight
    f. Reshape the output image vector back to the original dimension (1003230 -> 471x710x3)
    g. Output as the temporary image in **"./tmp/wave_and_pond.bmp"**
3. Read in the lion and the temporary image and construct the matrix
   Basically, this step is the same as step1. The only difference is if the pixel value of the **lion image is less than 0.015 (threshold) then I repace with 0**
4. Calculate the weighted mean and output it as the resulting image saved as **"./output/sample.bmp"**

Part2: Choose 2 to 3 images by yourself to do image composition - try 1

1. Resise the image: using online converter **picresize**
2. Change the image type
3. Read in the images and construct the matrix
4. Calculate the weighted mean as the output image

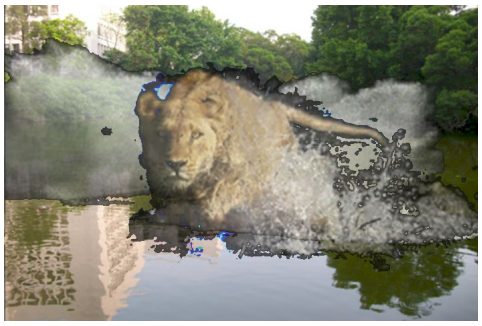
Part3: Choose 2 to 3 images by yourself to do image composition - try 2

1. Resize the image
2. Change the image type
3. Read in the image and construct the matrix
4. Calculate the weighted mean as the output image

Results

The results are all stored in the folder **"./output"**.

- Part1: **sample.bmp**
- Part2: **my_composition_1.bmp**
- Part3: **my_composition_2.bmp**



sample ***my_composition_1*** ***my_composition_2***

Discussion

Part1

The result of part1 looks not so great comparing to part2 and part3. I think there are 3 reasons.

1. If using more pictures to do image composition it will be more difficult to set perfect weights to make the resulting image looks great.
2. **Black color pixels are something difficult to cope with**
   Although from the instruction we all know if encountering pixel value is 0 then we don't count that pixel into weighted mean. But sometimes there is some black in the pixel but not all black so the value isn't 0 then this pixel will affect the weighted sum. The output image will not look natural.
3. **The color of each image affects the result**
   The three given image looks so different in the color they use so composing them definitely have a big challenge. If they have much more similar color (warm or dark) then the composition will have better output.

Part2 and Part3

Part2 and Part 3 have better output results. I think the reason is that the original image I choose. I deliberately select the images with the following characteristics:

- The images have the same theme (morning, night)
- The images using the same color series (warm, dark)

This way I don't need to spend so much time deciding the weights. If I want to emphasize one image over another I just simply raise its weight and the output image looks perfect.

Problems and Difficulties

The difficulty I encountered has been mentioned in the discussion of part1. Coping with black pixels isn't a simple thing. I tried to improve the output image with a method. I first compose **wave and pond**. In these two images, there is only the wave image has a black margin. I use **threshold=0.095**. If the pixel value of the wave image is less than 0.095 than I set it to 0. In the composition, if the value is 0 then I use the pond image to represent that pixel instead of calculating the weighted mean. Then I output a temporary image (wave and pond

composition). Next, I compose **the temporary image and the lion**. This time only the lion has a black margin. I do the same thing but this time the **threshold is=0.015**.

- If choose value **larger value as the threshold** then some important pixel value will be ignored which causing the output image having some pixels which have some really weird colors, such as bright light blue, bright purple or pink.
- If choose value **smaller value as the threshold** then the discreteness (black margin) around the lion and the wave is too obvious, which makes the composition effect not so good.

Although setting threshold did help a bit but result still isn't that great. I need to compromise between the two conditions I mentioned above. I come up with the conclusion that the influencing factor isn't only black pixel that simple. The fineness of the image is a factor too. If the fineness of the original picture is higher I think the result will be better because more pixels will have more accurate pixel value so that real black and other colors can be separate.