

Digital Image Processing (2024)

Homework 2

{Low-luminosity Enhancement + Sharpness Enhancement + Denoise}

Deadline: 11.11.07 23:59

Low-luminosity Enhancement (20%)

Using C++ or C, improve the luminosity of the given input image.



[Input] input1.bmp

[Output] output1.bmp

Sharpness Enhancement (30%)

Using C++ or C, perform sharpness enhancement on the given image. You should output images with 2 different degrees of modification.



[Input] input2.bmp

[Output] output2_1.bmp
output2_2.bmp

Denoise (30% + 20%)

Using C++ or C, remove the noise in the given two input images. You should output images with 2 different degrees of modification. You must write a SSIM (Structural Similarity Index) code to evaluate the results after denoising. The formula for SSIM is in the next page (20% of the grade will be based on your SSIM score for **image2**) File names with a suffix **_1** will be the image we use for evaluation:



Image 1



Image 2

[Input]	input3.bmp (Image 1)	input4.bmp (Image 2)
[Output]	output3_1.bmp output3_2.bmp	output4_1.bmp (evaluation) output4_2.bmp

SSIM (Structural Similarity Index)

- A common setting: $\alpha = \beta = \gamma = 1, C_3 = \frac{C_2}{2}$

$$\Rightarrow SSIM(x, y) = \frac{2\mu_x\mu_y + C_1}{\mu_x^2 + \mu_y^2 + C_1} \frac{2\sigma_{xy} + C_2}{\sigma_x^2 + \sigma_y^2 + C_2}$$

- The value of SSIM ranges from -1 to 1
 - ✓ SSIM = 1: identical images
 - ✓ SSIM = 0: completely dissimilar images
 - ✓ SSIM \rightarrow -1: inversely related images or highly divergent contrast or luminance

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Homework Rules and Grading Policy

Homework will be graded by:

1. (Correctness (80%) + Performance (20%)) *0.7
 2. Report (30%)
 - Low-luminosity Enhancement
 - Do some discussions in most 1 page (A4).
 - Sharpness Enhancement
 - Do some discussions in most 1 page (A4).
 - Denoise
 - Explain how you do it in most 1 page (A4).
 - Do some discussions in most 1 page (A4).
- Make sure to clearly label your output image.

Demo:

Online Demo

Upload:

[web] E3

[File Name] hw2_StudentID.zip (ex: hw2_123456789.zip)

- report in the format of .pdf.
- three C, C++ codes with comments (It's ok if you combine the 3 codes into 1).
- ReadMe.txt file which describes how to run your program.
- all output images.

Remind:

Deadline

We DO NOT accept any late submission after the deadline.

Test failure

If you does not pass the demo, half of the score will be deducted, but there is a chance for remediation.

Plagiarism

We will check for code similarity. If two codes exist high similarity. Both codes receive zero marks after confirmation.

Notice

Cannot use the toolbox. (OpenCV)