CDS6334 Visual Information Processing

Trimester 2430

Week 4 Blended Learning Programming Task

1. Task: Image Enhancement Function

You are given a small dataset of 4 low-quality images and their corresponding ground truth as shown in Fig. 1, with 2 accompanying Python codes (adjustContrast.py and evaluateContrast.py).

Figure 1: Images for programming task
(Top row: Low-quality images; Bottom row: Ground truth images)

Your task is to design a solution to enhance the low-quality images in adjustContrast.py and evaluate your results using MSE, PSNR, and SSIM metrics contained in evaluateContrast.py.

Note: You may try to design the Contrast Stretching function as a solution.

2. Scripts and Functions

2.1 Codes to Write

The working function `adjustContrast` that you need to write is contained within `adjustContrast.py`

```
def adjustContrast (img):
```

```
# write your code here
…
return outputImg
```

The input and output of the `adjustContrast` function are specified as follows:

inputImg : Input image, 3D numpy array of row×col×3 in BGR format

outputImg: Enhanced image in RGB format

2.2 Evaluation Function

An evaluation function is provided to test your algorithm:

evaluateContrast.py: Evaluate **Mean Absolute Error (MAE)**, **Peak Signal-to-Noise Ratio (PSNR)**, and **Structural Similarity (SSIM) Index** between the enhanced output with the corresponding ground truth. It also returns the average evaluation if given an image set.

The function is runnable on Anaconda Prompt or standard command-line prompt (if necessary, path settings have been configured). You can use the `-h` switch to get further help on how to use these functions, and what other options there are.

Note: The code of this function is just for your reference and will only be used to test your function script. You do not have to change the code of this function unless you want to test on your own datasets and directories, where you only need to change the Default Parameters.

2.2.1 Package Requirement

The vanilla Anaconda installation does not come with the `PrettyTable` package. Please install via pip at Anaconda Prompt

```
> pip install prettytable
```

2.2.2 Example of Usages

This command to evaluate all images:

```
> python evaluateContrast.py
```

Or this command to show detailed image-by-image results:

```
> python evaluatreContrast.py -v
```

It implements the enhancement and evaluates the whole image set in the directories specified under the **Default Parameters** on the simple result display setting as follows:

```
####  IMAGE RESULTS  ####
+----------+--------------+-----------+-----------+
| Image |    MAE    |   PSNR  |   SSIM  |
+----------+--------------+-----------+-----------+
|    1   | 130.5207 | 4.6148 | 0.0025 |
|    2   | 121.7925 | 4.9607 | 0.0022 |
|    3   | 129.1899 | 4.6839 | 0.0054 |
|    4   | 129.7045 | 4.6788 | 0.0037 |
|        |              |           |           |
|  All   | 127.8019 | 4.7345 | 0.0035 |
+----------+--------------+-----------+-----------+
```

To perform this full evaluation on another image set, simply change the **Default Parameters** in the evaluateContrast.py file to specify the file directories and the number of images.

3. Submission

Submit the `adjustContrast.py` file ONLY via **eBwise** after answering the questions related to the videos.

End of Task Guideline.