EECS 225B Problem Set 5

Due on 04/06/2020 at 9am on Gradescope

PROBLEM 1: In the problem set zip, there is a file `NoisyImg.bmp`, which is a 256-level gray image of a truck in a desert which has been corrupted by noise. First, apply median filtering to the given image and save the restored image as `Median.bmp`. Next, apply adaptive Wiener filtering to the given image and save the restored image as `Wiener.bmp`. Implement adaptive median filtering as described in class and apply it to the given image, and save the restored image as `AdaptiveMedian.bmp`. Devise your own technique by combining two or more of the previous techniques to improve the quality of the restoration. Compare and contrast your result with the previous three, and save the restored image as `ResultA.bmp`.

PROBLEM 2: In the problem set zip, there is a second file `NoisyBlur.bmp`, which is a 256-level gray image of some gingo nuts, corrupted by blur and additive noise. The blurring filter is given by the `fspecial` command shown below. Use a combination of noise-removal and the iterative deconvolution algorithm described in class to restore the image. As the number of iterations increases, the image gets sharper but the amount of ringing will increase. Save three sample images, a blurry one with no ringing (`ResultB.bmp`), a sharper one with little ringing (`ResultC.bmp`), and even sharper one with a lot of ringing (`ResultD.bmp`). Be sure to indicate the number of iterations and the choice of β.

Here are some helpful Matlab commands:

wiener2	Adaptive Wiener filtering
medfilt2	2D median filtering
ordfilt2	2D order-statistic filtering
fspecial('disk', 3)	Blurring filter
imfilter, conv2, filter2	Apply a 2D-filter to an image

If you choose to do this homework in Python, you can use library functions analogous to the ones given above.

Note:

1. For each problem, you need to:
    1. Email your source code (zip it before you email) to eecs225bsp20@gmail.com if the question asks for any implementations.
        1. Make sure your code is executable. Either MATLAB or Python is okay. Please avoid C/C++ if possible (appreciate it!). If using Python, Jupyter Notebooks are preferred.
        2. Email title: FirstName_LastName_HW#. For example, Scott_McCrae_HW1.
        3. Submit a single PDF file on Gradescope which contains: i. your answer for each problem; ii. your source code (please also paste your source code here;

screenshots are okay); iii. your output image(s). Make sure to prepare your solution to each problem on a separate page. On Gradescope, please select and match each page to the corresponding problems.

2. Please also read the class website carefully about the homework policy. You're allowed to collaborate with other students on homework, but each student needs to write up their own original solutions. **Please do not submit the exact same writeup or code, as this is considered academic dishonesty. Copying solutions from any source is considered academic dishonesty as well.**