

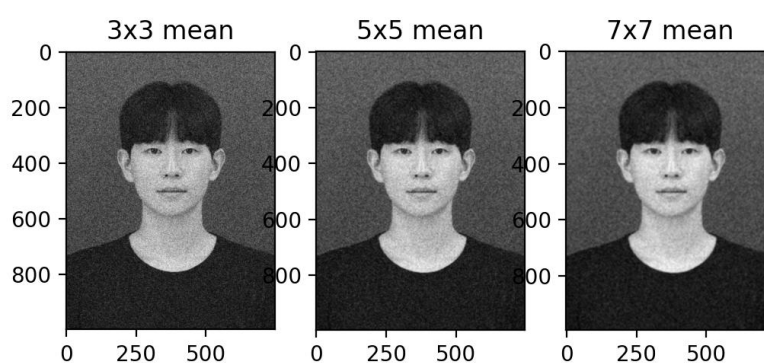
ITE4052 Computer Vision (Spring 2024) Programming Assignment 2

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1. Mean Filtering

Gaussian noise with $\mu=0$ and $\sigma=50$ is added to my own image. After filtered by mean filters, my noisy image gets gradually smoother – blurrier at the same time – from 3x3 to 7x7 mask.

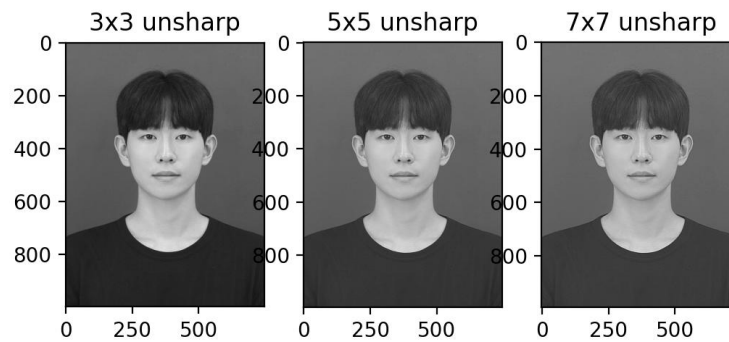


```
(cv) justin@ubuntu-lax1:~/workspace/cv/m2$ python5 m21.py
PSNR for 3x3 mean filtered noisy image : 15.74653752564818
PSNR for 5x5 mean filtered noisy image : 15.363468471704119
PSNR for 7x7 mean filtered noisy image : 15.223009017871759
(1000, 750)
```

PSNR scores are all quite low because of Gaussian noise. Also it gets lower when the filter size gets bigger, which means dissimilarity between images got bigger. Note this statement is valid in

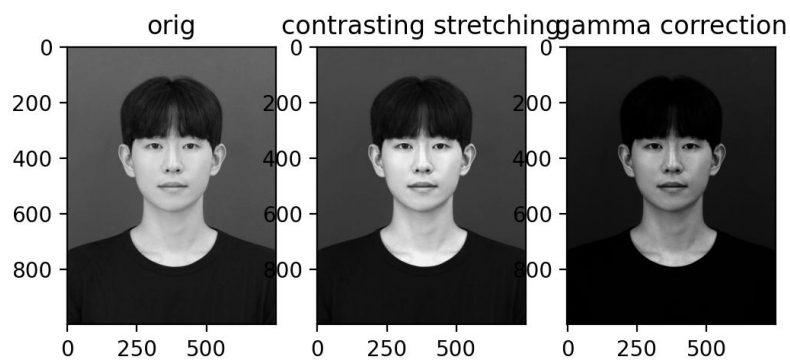
terms of score but it can be different in terms of human(our) perception.

2. Unsharp Masking



Unlike its name, unsharpening mask is for sharpening the given image. It is hard to tell something in terms of how sharpened it got since my own image is already quite sharpened. But basically 3x3 mask is supposed to more focus on sharpening local regions whereas 5x5 and 7x7 will produce more widely-considered sharpening.

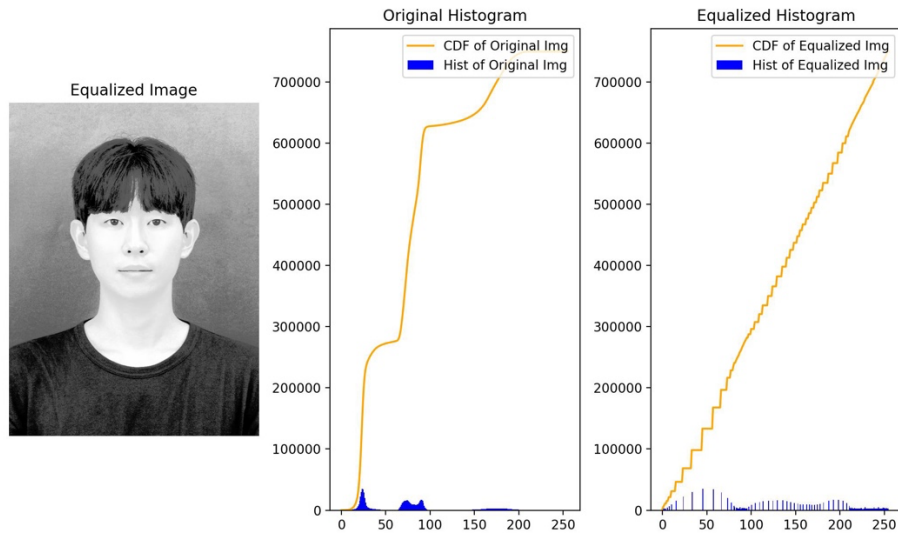
3. Contrast Stretching



- 1) By contrast stretching, the output image got brighter in regions where pixels of original image were relatively bright while got darker in regions where pixels were relatively dark. This corresponds well to the meaning of the name „contrast stretching“.
- 2) With gamma correction($\gamma = 2.2$), my image got darker since $x^{2.2}$ is below x within $[0, 1]$. To take this property, I applied normalization right before gamma

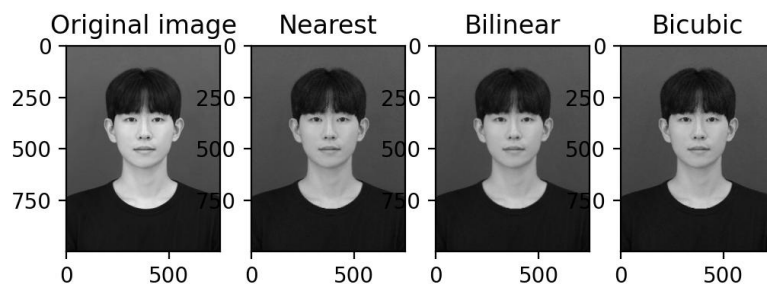
correction then restore values to the original scale.

4. Histogram Equalization



The histogram is more spaced compared to original one and CDF becomes almost complete linear function after applying histogram equalization.

5. Image Upsampling



```
PSNR for upsampled image by nearest : 33.46026335283689
PSNR for upsampled image by bilinear : 36.3341492660901
PSNR for upsampled image by bicubic : 36.343051674425986
```

Upsampled images are almost the same to the original image in terms of human perception. Seeing PSNR scores, three are all over 30 that is decent score for image restoration. Especially bilinear and bicubic interpolation method show better PSNR(= better image quality) than nearest neighbor method.