CSP780 : Computer Vision
Assignment - 1
Report

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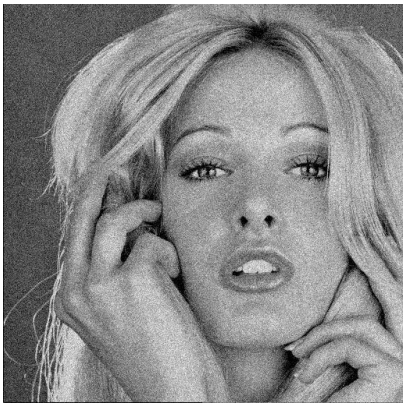
1 Introduction

We are given with a noisy image and it is to be smoothed by applying various spatial filters.



The following filters of sizes 3x3, 5x5 and 7x7 are applied and the various outputs obtained have been observed :

- Low-Pass (Average Filter)
- Gaussian Filter
- Bilateral Filter
- Non-local means filter

Also, BRISQUE scores are obtained to get the No-Reference Image Quality Assessment Score. They are shown in the table below:

Original Noisy Image: 61.30

Filter	Filter Size	BRISQUE Score
Low Pass (Avg)	3x3	16.45
Low Pass (Avg)	5x5	34.70
Low Pass (Avg)	7x7	38.61
Gaussian	3x3	28.88
Gaussian	5x5	33.28
Gaussian	7x7	32.99
Bilateral	3x3	16.20
Bilateral	5x5	23.68
Bilateral	7x7	22.22
Non-local Means	3x3	57.37
Non-local Means	5x5	41.09
Non-local Means	7x7	27.38

Figure 1: Table showing the BRISQE scores

From the table, we can draw the inference that the 3x3 bilateral filter gives the best perceptual quality image as it has the lowest BRISQUE score. Following this, the average 3x3 filter also provides a good image.

2 Conclusion:

- The bilateral filter includes both the qualities of the gaussian filter and also preserves the edges in the original image, thus reducing noise as well as maintaining image quality.
- The Gaussian filter does a better noise removal compared to the low pass average filter as visible from the BRISQUE scores. This is

because the average filter leads to blurring effects.
- The non-local means 3x3 and 5x5 filtering has poor BRISQUE scores, which are closer to the noisy images. This is mainly due to the smaller filter size and larger 7x7 window considered. Also, NLM filtering is computationally complex, so other filtering techniques, being simple to compute are considered better.