Advanced Image Processing: Assignment 3 Report

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1 Problem 1: Image Denoising

1.1 Low-Pass Gaussian Filter

A low-pass Gaussian filter was applied to the noisy image with different filter sizes and standard deviations. The best filter was selected based on the lowest Mean Squared Error (MSE). Below is the Filter Size with lowest MSE

Filter Size	Standard Deviation	MSE
3	1.0	90.06

Table 1: MSE value for best filter parameters.

1.2 SureShrink with High-Pass Processing

A wavelet shrinkage approach using SureShrink was applied to the high-pass coefficients of the noisy image.

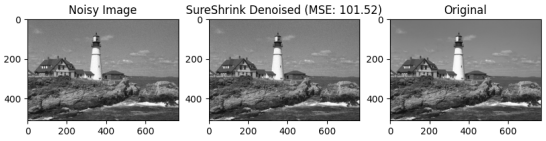

Figure 1

1.3 Multiscale SureShrink

Different scales were tested for SureShrink, and the best performance was recorded. The table below presents the MSE values for varying scales.

Number of Scales	MSE
1	10772.87
2	10860.16
3	11202.57
4	11786.00

Table 2: MSE values for different scales in Multiscale SureShrink.

2 Problem 2: BM3D Denoising

2.1 Performance at Different Stages

The BM3D algorithm was applied to the noisy image, and MSE was computed at the output of the first and second stages.

BM3D Stage	MSE
First	34.07
Second	29.15

Table 3: MSE values for BM3D first and second stages.

2.2 Effect of Noise Variance on BM3D

The relationship between input noise variance and MSE was studied. The plot below shows the variation of MSE with increasing noise variance.

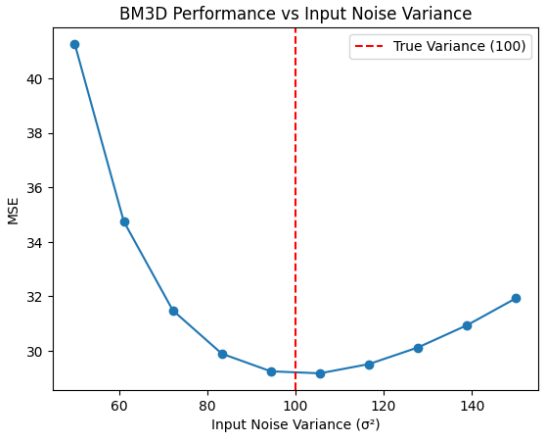

Figure 2: MSE vs. noise variance in BM3D.