CS4650

Assignment 3: Noise Filtering

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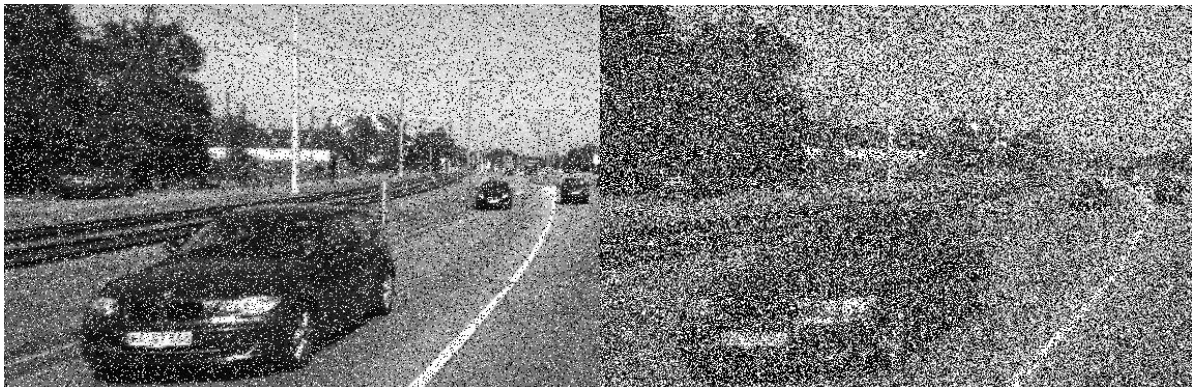
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Part 1, 2

Original Image

Noisy Images

Filtered Images

Gaussian

Noise 1: sigma=2

Noise 2: sigma=2

Noise 1: sigma=7

Noise 2: sigma=7

Median

Noise 1: 7x7

Noise 2: 7x7

Noise 1: 19x19   Noise 2: 19x19

Part 1, 2 Results

|	MSE				
	Noisy (not processed)	Gaussian Filter sigma=2	Gaussian Filter sigma=7	Median Filter (7x7)	Median Filter (19x19)
Test1Noise1	4357.134	511.109	892.932	203.735	558.373
Test1Noise2	12983.429	2354.416	2473.259	400.794	583.466

Part 1, 2 Analysis

The gaussian and median filters are effective at removing noise, as shown above. For this specific noise, the median (7x7) filter produced the best results, with the lowest mean squared error. However, to consider these results acceptable, preserving the minute details of the image must not be of concern. In even the best result of the eight test cases, a small (but likely important) detail, the license plate sequence, cannot be discerned. While the gaussian and median filters can improve the noisiness of an image by blurring it, their usefulness extent for an image with this noise is making the larger objects and details slightly more visible.

Part 3

Original Images

Noisy Images
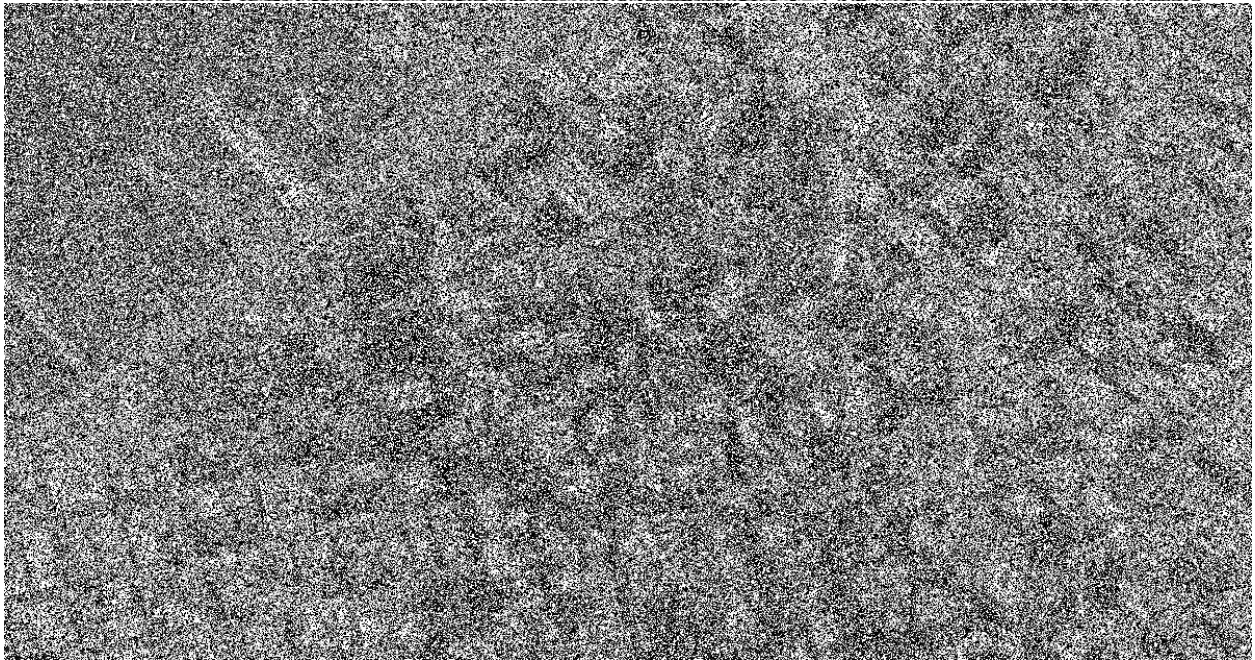
Filtered Images

Test 1: AMF 7x7   Test 1: AMF 19x19

Test 2: AMF 7x7

Test 2: AMF 19x19

Part 3 Results

	MSE			Processing Time	
	Noisy	Adaptive Median Smax = [7x7]	Adaptive Median Smax=[19x19]	Adaptive Median Smax=[7x7]	Adaptive Median Smax=[19x19]
Test1Noise2	12983.429	202.156	177.936	4.7	5.7
Test2Noise2	14175.325	1044.031	777.938	18.9	19.8

Part 3 Analysis

This approach created acceptable results. It took the more noisy images and filtered them to the point where small letters and characters were almost recognizable. If this approach was applied to images with a moderate amount of noise, it would create a very clear image. The larger the maximum window size, the more accurate the results were in comparison to the original image. This can be seen in the table under MSE. It is important to note that the MSE calculation supports that the adaptive median filter is a more acceptable result than the gaussian or median filter, specifically because of the common test case where the MSE is less using the adaptive median filter. The visual results confirm as much. The original noisy images are almost incomprehensible, while the features of the computed images are very obviously distinguished. In conclusion, the adaptive median filter is a much more acceptable method of filtering than the median or gaussian filters.