Image Denoising using Adaptive Hybrid Method- An Application with Additive, Multiplicative Noise

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Abstract-- This research studied the effect of additive and multiplicative noise in images, and their solution. Salt n pepper, and Gaussian noise is considered as a additive noise, while impulsive noise is considered as a multiplicative noise. For additive noise, this paper presents the outcome of Wiener filter, and Pseudo inverse filter, while for impulsive noise, we studied wavelet denoising. A hybrid filter approach is also performed and outcomes are presented. The mean square error, and Peak signal to noise ratio is considered as a parameter for evaluation of filters. The software used for simulation is MATLAB 7.8.1.

I. INTRODUCTION

Image denoising is very crucial for image processing. There are lots of ways available to denoise the images. Debasement originates from obscuring and commotion because of electronic and photometric sources. Smearing is a type of data transfer capacity decrease of the picture brought about by the flawed picture development process, for example, relative movement between the cam and the first scene or by an optical framework that is out of center [2]. At the point when flying photos are delivered for remote sensing purposes, smudges are presented by climatic turbulence, distortions in the optical framework and relative movement in the middle of cam and ground. Notwithstanding these obscuring impacts, the recorded picture is ruined by clamors as well. A commotion is presented in the transmission medium because of a loud channel, mistakes amid the estimation process and amid quantization of the information for advanced stockpiling. Every component in the imaging chain, for example, lenses, film, digitizer, and so on add to the debasement.

Image restoration technique aims at reversing the degradation undergone by an image to recover the true image. Images may be corrupted by degradation such as linear frequency distortion, noise, and blocking artefacts. The degradation consists of two distinct processes:

I) The deterministic blur
II) The random noise

The smudge may be because of various reasons, for example, movement, defocusing, and barometrical turbulence. The clamor may start in the picture arrangement prepare, the transmission methodology, or a blend of them. Most rebuilding procedures display the debasement process and endeavor to apply an opposite method to acquire an estimate of the first picture. Numerous picture rebuilding calculations have their roots in decently created zones of science, for example, estimation hypothesis, the arrangement of not well postured issues, straight variable based math and numerical investigation. Iterative picture rebuilding procedures regularly endeavor to restore a picture directly or non-straightly by minimizing a few measures of debasement, for example, most extreme probability, obliged slightest square, and so on. Blind rebuilding strategies endeavor to tackle the reclamation issue without knowing the smearing capacity. No general hypothesis of picture rebuilding has yet unraveled; notwithstanding, a few arrangements have been created for direct and planar invariant framework.

Advanced pictures are destroyed by various types of commotion amid the methodology of procurement/getting/learning and/or transmission. The recognition and evacuation of this commotion assumes a to a great degree vital part in (remaking/replenishment). Speculating (a number) the clamor level from a solitary picture appears like a unimaginable employment, and because of this we have to perceive whether neighborhood picture contrasts/distinctive forms are man to shading, surface, or lighting contrasts/diverse adaptations from the picture itself or because of the commotion. It may appear that (near to reality or genuine number) speculation of the commotion level would oblige an extremely favor (or keen) former model for pictures.

Picture denoising is regularly utilized as a part of the field of photography or distributed where a picture was by one means or another corrupted however needs to be enhanced before it can be printed.
For this sort of use we have to know something about the debasement handle so as to build up a model for it. When we have a model for the debasement handle, the reverse procedure can be connected to the picture to restore it back to the first structure. This kind of picture reclamation is frequently utilized as a part of space investigation to help dispose of curios created by mechanical jitter in a shuttle or to adjust for mutilation in the optical arrangement of a telescope. Picture denoising discovers applications in fields, for example, space science where the determination constraints are extreme, in restorative imaging where the physical necessities for top notch imaging are required for investigating pictures of novel occasions, and in scientific science where conceivably helpful photographic confirmation is now and again of greatly terrible quality [3].

To denoise some standard pictures ruined with added substance repetitive sound. Trial results demonstrate that the new system outflanks VisuShrink, the conventional ridgelet picture denoising, and wiener2 channel both as far as crest sign to-commotion proportion and in visual quality. Specifically, our strategy saves sharp edges better while evacuating repetitive sound. Complex ridgelets could be connected to curvelet picture denoising too.

II. PROPOSED ALGORITHM

- Enter the image
- Resize the image into 256 x 256 size.
- Initialize the sigma, gamma, alpha variable.
- If noise ==0
- Add the noise
- Else
- Goto step 4
- End
- Enter the size off mask or window
- Calculate fft of the input image, called y.
- Calculate the fft of the input mask with the level = size of mask.
- Initialize the point spread function based on the value of row and column of mask
- Determine the frequency response by Calculating the fft of the point spread function.
- Perform the Inverse filtering of the frequency response obtained by step 8.
- Calculate the Inverse fft of the result obtained from step 9 with only considering real part.
- Calculate the fft of the result obtained from step 10.
- Calculate the power of function retrieved from step 11.
- Calculate the S-frequecy response using gamma function.
- Calculate the i- frequency response using gamma function.
- Calculate the power in consideration with sigma.
- Calculate the frequency response of the result obtained from step 16, called freqh.
- Determine the element by multiplication of y and freqh.
- Determine the inverse fft of the result obtained from step 18 with only considering real part, called final de-noised image.
- Calculate the SNR of the de-noised image.

III. RESULT AND DISCUSSION

<table>
<thead>
<tr>
<th>Image</th>
<th>METHODS</th>
<th>SNR OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI Brain</td>
<td>Pseudo Inverse Filter</td>
<td>22.45</td>
</tr>
<tr>
<td></td>
<td>Wiener Filter</td>
<td>31.53</td>
</tr>
<tr>
<td></td>
<td>Hybrid FILTER</td>
<td>43.66</td>
</tr>
<tr>
<td></td>
<td>Speckle Remover</td>
<td>68.22</td>
</tr>
<tr>
<td>Hill Image</td>
<td>Pseudo Inverse Filter</td>
<td>24.57</td>
</tr>
<tr>
<td></td>
<td>Wiener Filter</td>
<td>31.49</td>
</tr>
<tr>
<td></td>
<td>Hybrid FILTER</td>
<td>41.59</td>
</tr>
<tr>
<td></td>
<td>Speckle Remover</td>
<td>73.37</td>
</tr>
</tbody>
</table>
Result 1

Result 2

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From Table it can be seen that the mathematical results obtained from the SNR computation and the experimental results shown in the image outputs in literature. For the multifractal denoising, the SNR computation is not compatible because, the brightness of the output image has been decreased.

IV. CONCLUSION AND FUTURE WORK

The research shows the outcomes of various image processing filters when applied to images disturbed by various kind of noises. For additive noise, Pseudo inverse, and Wiener filter is applied while, wavelet filtering is applied for multiplicative type of noise called speckle noise. If the properties of the noiseless signal are implemented into a neural network pattern recognizer, then the rate of successful classification should determine great measure by which to compare various noise removing procedures.

REFERENCES