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Data Processing Through Image Processing using Gaussian Minimum Shift Keying

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ABSTRACT
Image Denoising is an important pre-processing task which is used before further processing of image. The purpose of denoising is to remove the noise while retaining the edges and other detailed features. This noise gets introduced during the process of acquisition, transmission & reception and storage & retrieval of the data. Due to this there is degradation in visual quality of image. Wavelets play a major role in image compression and image denoising as they support the property of sparsity and multi resolution structure. Wavelet Thresholding is important technique in wavelet domain filtering. Many image filters are found which perform well when the noise conditions are low. But as the noise conditions go on increasing their performance gets degraded. Thus, it is felt that there is sufficient scope to investigate and develop quite efficient but simple algorithms to suppress moderate and high power noise in images.

Keywords: *Denoising, SNR, FFT, AST.*

I. INTRODUCTION
"**Image denoising** is a restoration process, where attempts are made to recover an image that has been degraded by using prior knowledge of the degradation process".

Image denoising is one of the important and essential components of image processing. Many scientific data sets picked by the sensors are normally contaminated by noise. It is contaminated either due to the data acquisition process, or due to naturally occurring phenomenon. There are several special cases of distortion. One two of the most prevalent cases is due to the additive white gaussian noise caused by poor image acquisition or by communicating the image data through noisy channels. Other categories include impulse and speckle noises. The goal of denoising algorithm is to remove the unwanted noise while preserving the important signal features as much as possible. Noise elimination introduces artifacts and blur in the images. So image denoising is still a challenging task for the investigators. Several methods are being developed to perform denoising of corrupted images. The two fundamental approaches of image denoising are the spatial filtering methods and transform domain filtering methods. Spatial filters operate a low-pass filtering on a set of pixel data with an assumption that the noise reside in the higher region of the frequency spectrum. Spatial low-pass filters not only provide smoothing but also blur edges in signals and images. Whereas high pass filters improve the spatial resolution, and can make edges sharper, but it will also intensify the noisy background. Fourier transform domain filters in signal processing involve a trade-off between the signal-to-noise ratio (SNR) and the spatial resolution of the signal processed. Using Fast Fourier Transform (FFT) the denoising method is basically a low pass filtering procedure, in which edges of the denoised image are not as sharp as it is in the original image. Due to FFT basis functions the edge information is extended across frequencies, which are not being localized in time or space. Hence low pass-filtering results in the spreading of the edges. Wavelet theory, due to the advantage of localization in time and space, results in denoising with edge preservation. The success of denoising technique is ensured by the ability of de-correlation (separation of noise and useful signal) of the different discrete wavelet 3 transform coefficients. As the signal is contained in a small number of coefficients of such a transform, all other coefficients

essentially contain noise. By filtering these coefficients, most of the noise is eliminated. Currently there is a large proliferation of digital data. Multimedia is an evolving method of presenting many types of information. Multimedia combines text, sound, pictures and animation in a digital format to relate an idea. In future multimedia may be readily available as newspapers and magazines. The multimedia and other types of digital data require large memory for storage, high bandwidth for transmission and more communication time. The only means to get better on these resources is to compress the data size, so that it can be transmitted quickly and followed by decompression at the receiver. Another most significant and booming applications of the wavelet transform is image compression. More popular and efficient existing wavelet based coding standards like JPEG2000 can easily perform better than conventional coders like Discrete Cosine Transform (DCT) and JPEG. Unlike in DCT based image compression, the effectiveness of a wavelet based image coder depends on the choice of wavelet selection. However, different categories of images like medical images, satellite images and scanned documents do not have the same statistical properties as photographic images. The standard wavelets employed in image coders often do not match such images, resulting in lower compression and picture quality. It is significant to identify a specially adapted wavelet for non-photographic images. The goal of compression algorithm is to eliminate redundancy in the data i.e. the compression algorithms calculates which data is to be considered to recreate the original image along with the data to be removed. For example, many dots can be spotted in a photograph taken with a digital camera under low lighting conditions as shown in following figure.

Clean Barbara Image

Noisy Barbara Image

II. Problem Definition

We need to suppress the noise in an image. Denoising has many application in the field of image processing .before the image is subjected to any other processing task it should first undergo the process of Denoising. The purpose of Denoising is to remove the noise while retaining the edges and other detailed features as much as possible. In order to increase the performance of many algorithms related to denoising a high quality image is taken and some known noise is added to it. This noise will act as an input to the denoising algorithm which then produces an image close to the original HD image

III. Objectives

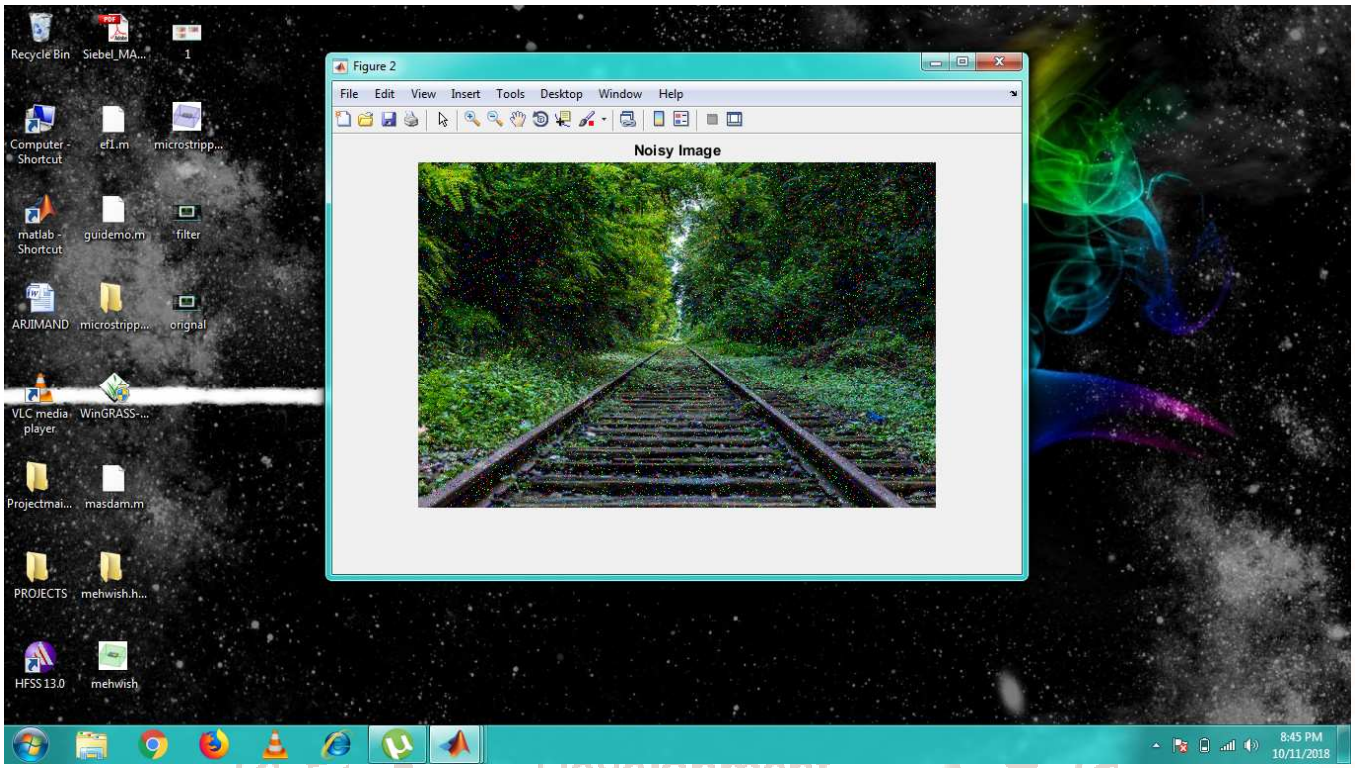
- The primary objective is to develop an efficient filtering and thresholding algorithm.
- The MATLAB based implementation of image denoising.
- To develop filtering and thresholding algorithm which gives better performance in both moderate and high noise level.
- Calculating and applying thresholds either globally in a level dependent manner or in a sub-band dependent manner may lead to quality image with less blurring and preserving more detailed information.

IV. Methodology

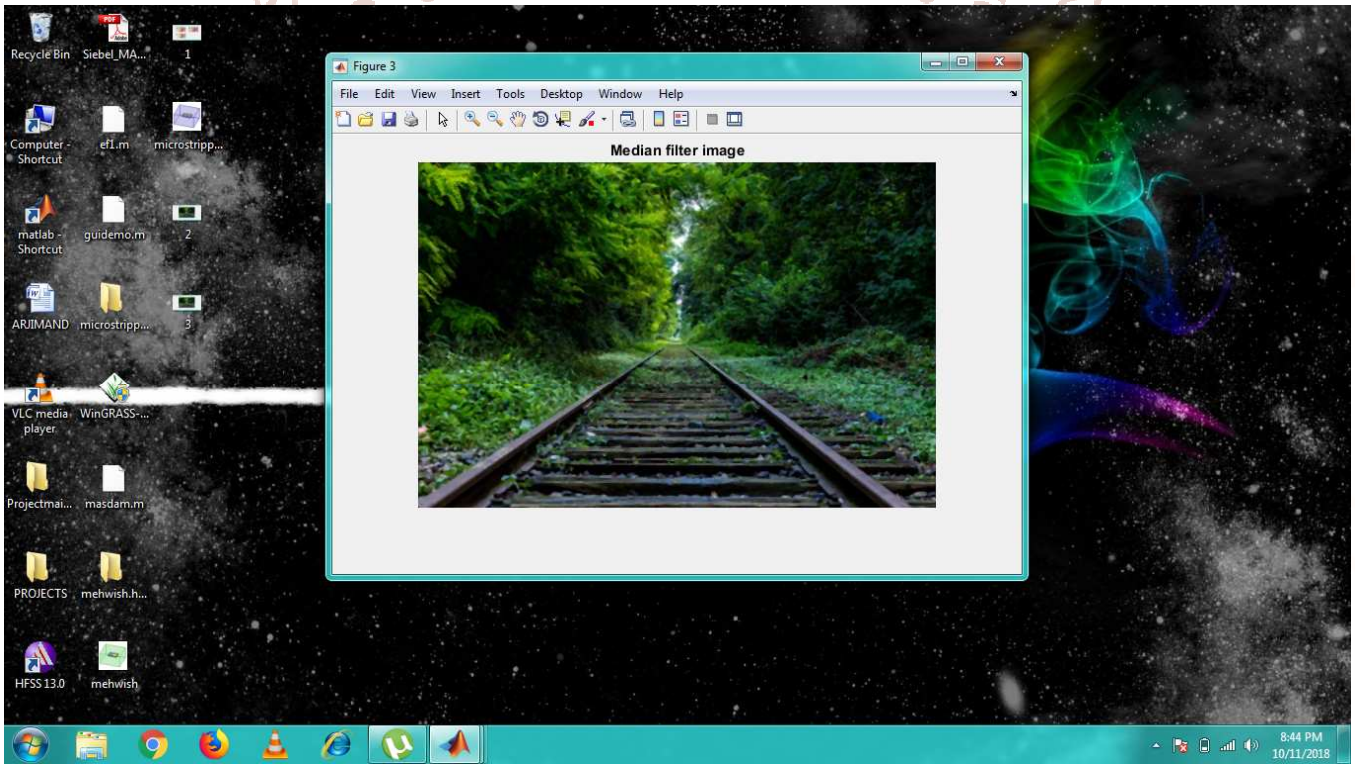
Image denoising is a common procedure in digital image processing aiming at the suppression of additive white Gaussian noise (AWGN) that might have corrupted an image during its acquisition or transmission. This procedure is traditionally performed in the spatial-domain or transform-domain by filtering. In spatial-domain filtering, the filtering operation is performed on image pixels directly. The main idea behind the spatial-domain filtering is to convolve a mask with the whole image. The mask is a small sub-image of any arbitrary size (e.g., 3×3, 5×5, 7×7, etc.). Other common names for mask are: window, template and kernel. An alternative way to suppress additive noise is to perform filtering process in the transform-domain. In order to do this, the image must be transformed into the frequency domains using a 2-D image transform. One approach that has received considerable attention in recent years is wavelet thresholding or shrinkage means an idea of killing coefficients of low magnitude relative to some threshold.

In this work an Adaptive Sub band Thresholding (AST) technique is developed based on wavelet coefficients in order to overcome the spatial adaptivity which is not well suited near object edges, where the variance field is not smoothly varied by producing effective results. This method describes a new way for suppression of Gaussian noise in image by fusing the wavelet denoising technique with optimized thresholding function to which a multiplying factor is included to make the threshold value dependent on decomposition level.

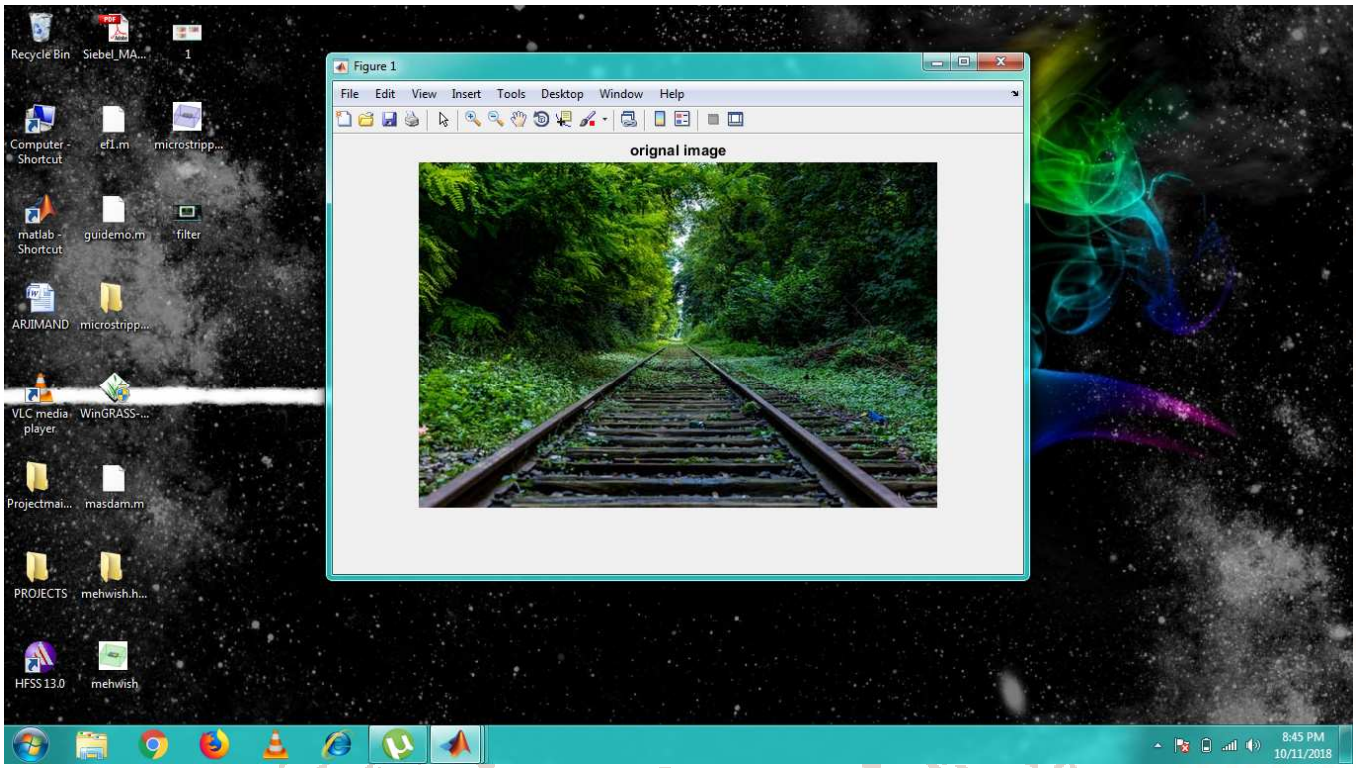
V. MATLAB Simulation



Noisy Image



MATLAB based Filtering



Denoised Image

VI. Conclusion

The image processing is a very hot research area in the present world of computing. The paper describes the image denoised concept and the practical implementation of image denoising using the popular MATLAB tool.

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