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"PERFORMANCE ANALYZE OF IMAGE DENOISING TECHNIQUES USING WAVELET TRANSFORMATION"

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ABSTRACT

In recent decades, the discrete Wavelet transform (DWT) has been applied to dispose the problem of noise reduction, and it has been shown to be outperformed to traditional filters in terms of root mean squared error (RMSE), PSNR and other evaluation indicators. In this dissertation we present the experimental study for the image denoising techniques. With the development of science and technology and the need of work and life, the application of digital image filtering will be more and more extensive, and the requirements will be higher and higher. So far, there are still many new ideas and methods in denoising, and constantly enrich image denoising methods. The experimental results show the mean with the traditional denoising methods, the proposed threshold-based denoising digital image denoising algorithm for digital image denoising is relatively clear, especially in the more noise, more complex cases", can show its good performance in the terms of better PSNR.

Key Words: *Image denoising, Transformation, Wavelet Transformation, Image Quality, Computer Vision.*

I. INTRODUCTION

Image denoising is one of the basic tasks for the researchers dealing with image processing since there may occur distortions of images during the acquisition, processing, compression, transmission or reconstruction processes. Therefore, it is important to eliminate the noise from the images and increase the quality, or produce good estimates from noisy ones. Images are affected by noise during their acquisition and transmission. Therefore, the denoising process is necessary to achieve higher quality images. However, both edges of the image and noise are characterized by high frequencies; loss of edge information may become unavoidable as a result of the denoising process. Thus, recovered, denoised images, become blurrier or less denoised. Therefore, a wavelet threshold denoising technique, based on edge detection, can be used to preserve more edge information and enhance the quality of the denoised image. The image noise can be Gauss, Poisson, or particle noise. The visuality and processing of the image are both affected by the noise. Therefore, it is aimed to preserve the useful information of the image and to reduce the noise by the image denoising process. Since denoising is a preliminary process in the field of image processing, almost all researchers interested in image processing have dealt with this problem and therefore researches on this effect made significant progress. Spectrum distribution is used for the traditional image denoising algorithms. Image denoising is one of the most important applications in image processing. Using the knowledge that high frequencies characterize noise as well as edges, the denoising process and edge detection can be combined. Thus, deficiencies in commonly used denoising

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methods can be overcome. Although many denoising and edge detection methods are used today, different methods can be useful in different noise and image types. In the wavelet edge detection method, it is important to determine the appropriate threshold value while thresholding wavelet coefficients because noises are not clustered in a few wavelet coefficients. Therefore, if the threshold is not chosen high enough, the noise may not be reduced significantly. On the other hand, if it has a higher value, the better denoising performance will occur however it will result in blurred edges.

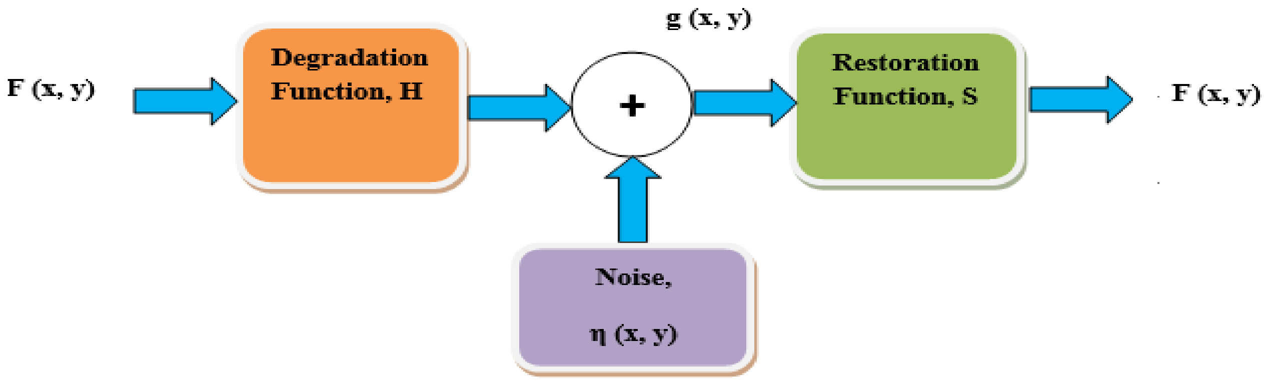

Fig. 1: Image degradation and restoration model.

As a challenging and improperly posed problem, dehazing has attracted wide attention in the field of image processing in recent years. It is very important to have high-quality images with rich information for present computer vision applications, such as object detection, semantic segmentation, image classification and aerial imaging. Limited by poor weather and lighting conditions, such as fog, smog and other human factors, the visibility of images is noticeably reduced and the image quality from cameras is greatly decreased, which severely hindered the execution and application of computer vision programs. Therefore, in recent years, image dehazing techniques have developed rapidly, which can greatly eliminate poor quality images and effectively help to restore hazy images [5]. As haze transmission depends on the unknown depth, image dehazing is a challenging and often improperly posed problem and the unknown depth at different locations will generate different variations. Recently, various techniques related to image enhancement have been implemented for image haze removal, including contrast enhancement for the entire or part of an image. Local histogram equalization, also known as block overlapping histogram equalization, can obtain global contrast enhancement regardless of the position of the input image. Single image dehazing is a difficult task due to the lack of information. In contrast, the human brain can quickly tell which areas are hazy from the natural environment without any help from other information. The convolutional neural network, accompanied by biological inspiration, has quite successful experience in advanced vision, such as object detection, image classification and face recognition. Nowadays, many wavelet-based techniques have been proposed for low order image processing. As many such methods focus on the super-resolution of films, a series of low-resolution images have emerged to infer information from high-resolution images. There are also many relevant techniques for single image super-resolution.

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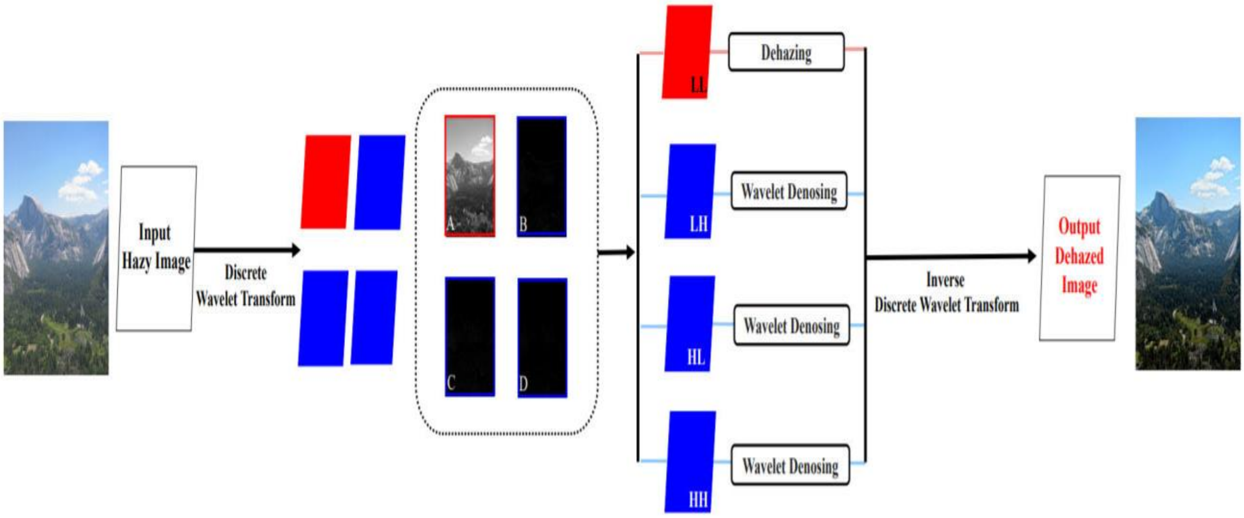

Fig. 2: Flowchart of the image denosing process.

II. Non-Linear Threshold Filtering

Most investigated domain in denoising using Wavelet Transform is the non-linear coefficient thresholding based methods. The procedure exploits sparsity property of the wavelet transform and the fact that the Wavelet Transform maps white noise in the signal domain to white noise in the transform domain. Thus, while signal energy becomes more concentrated into fewer coefficients in the transform domain, noise energy does not. It is this important principle that enables the separation of signal from noise. The procedure in which small coefficients are removed while others are left untouched is called Hard Thresholding [5]. But the method generates spurious blips, better known as artifacts, in the images as a result of unsuccessful attempts of removing moderately large noise coefficients. To overcome the demerits of hard thresholding, wavelet transform using soft thresholding was also introduced in [5]. In this scheme, coefficients above the threshold are shrunk by the absolute value of the threshold itself. Similar to soft thresholding, other techniques of applying thresholds are semi-soft thresholding and Garrote thresholding [6]. Most of the wavelet shrinkage literature is based on methods for choosing the optimal threshold which can be adaptive or non-adaptive to the image.

III. Proposed Work

Wavelet changes are currently being received for countless, frequently supplanting the ordinary Fourier Transform. Numerous ranges of research in different logical fields have seen this outlook change towards the utilization of wavelets, including astronomy, seismic geophysics, optics, therapeutic imaging, remote detecting and so on. Any information which is extremely influenced by commotion has the inborn confinement of elucidation and examination. Programmed programming investigation apparatuses implied for deciphering such information constantly gives wrong outcomes if utilized on loud informational collections, and henceforth such information are not valuable for ensuing applications. Recently wavelets, have been observed to be helpful for different flag and picture preparing undertakings as has been accounted for. The time-recurrence area investigation scope renders such system extremely valuable in the spaces of flag or picture pressure, denoising, picture improvement, determination upgrade, fractals and so on. However the vast majority of the outcomes have been appeared on recreated or optical informational indexes. In the field of genuine SAR information denoising has for the most part been done on medium determination pictures, for example, those from ERS, Radarsat-1 and so forth having around 25m determination, which have an alternate dissipating trademark contrasted with that of higher determination ones. One technique was accounted for which demonstrated that contourlet change gave better edge safeguarding and spot expulsion contrasted with ordinary wavelet based sifting for

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SAR information. In any case, the operation was performed on logarithmically packed information, which constantly diminishes the dynamic scope of the first flag and may not be alluring for high determination pictures. A large portion of the sifting connected on SAR pictures to enhance the dot do as such at the cost of spatial determination. With the appearance of high determination SAR information from different satellites, for example, Terrasar-X or Cosmo-Skymed, it turns into a testing undertaking to consider denoising of such information however with the negligible obscuring. Wavelet based denoising are being picked keeping in mind the end goal to go around this issue [1].

In this dissertation we proposed a novel methodology for image denoising based on wavelet thresholding techniques. Initially the discrete wavelet transform function is applied into input image. Now input image decomposed in to layer structure form. After that we calculate horizontal, vertical and diagonal coefficient of input image, after that we apply soft thresholding technique and generate trained pattern using ACP algorithm. Wavelets technique is very popular denoising approach in mathematics and digital image processing area because of their ability to effective represent and analysis of data. The current wavelet approach applies a wavelet transform on images in a pyramid fashion up to the desired scale using the theory of multi resolution signal decomposition with the wavelet representation and the concept of embedded zerotree wavelet (EZW) based on the decaying spectrum hypothesis.

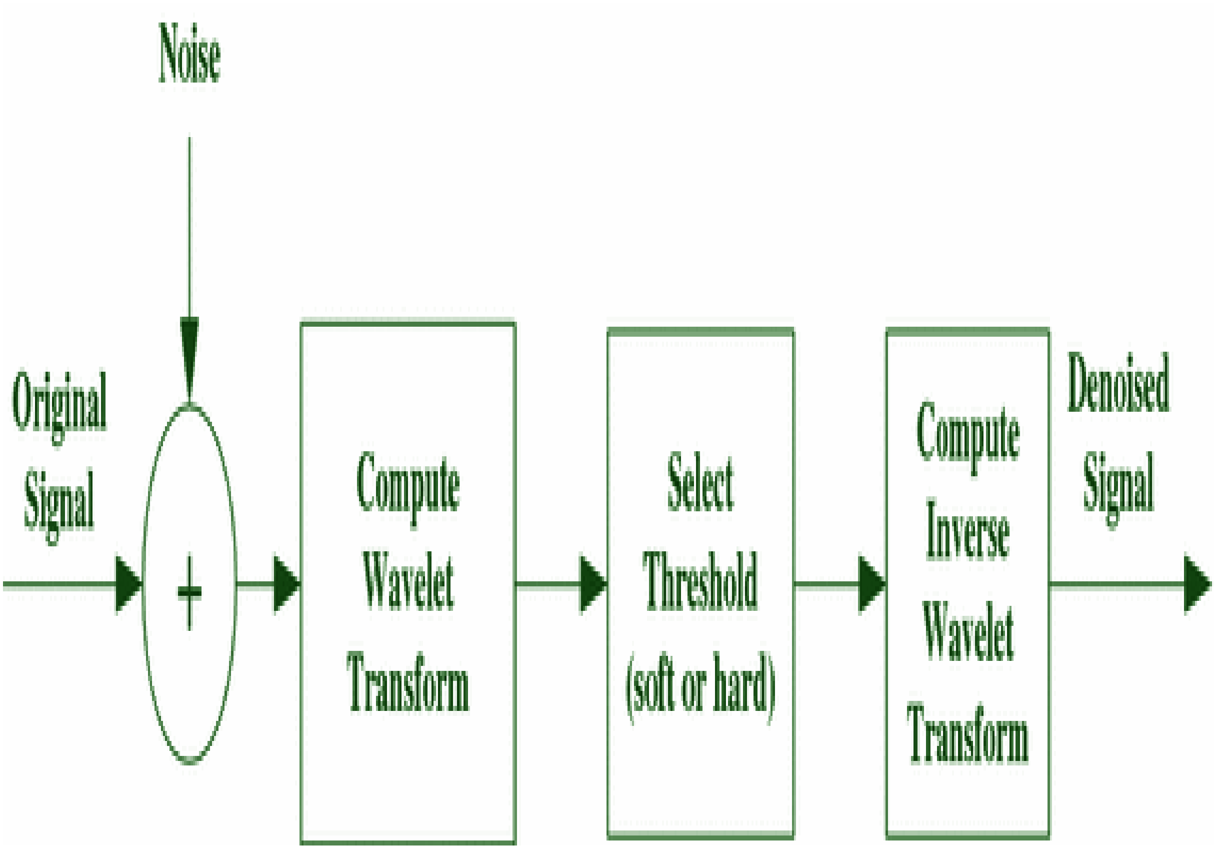

Fig. 3: Proposed block diagram for image denoising techniques.

IV. EXPERIMENTAL WORK

In this section the experimental process of image denoising techniques comparative performance is measured with the performance parameter. This process of image denoising is done by using methods that are with like wavelet transformation, wiener filter and PSF function. This all methods implemented in MATLAB. The input images are used here for the measured of image denoising techniques comparative performance used barbara image, apple image, cameraman image and leena image etc.

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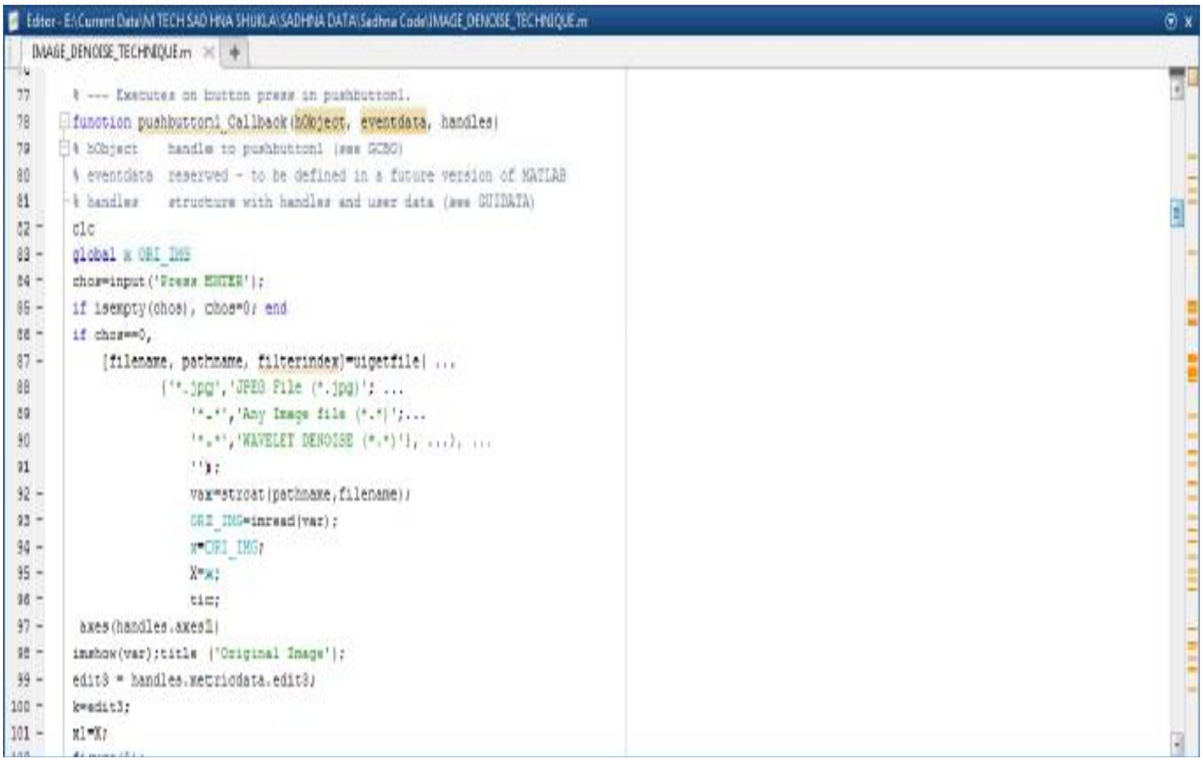

Fig. 4: This picture presents the initially code window for experimental work.

Fig. 5: This picture presents the cameraman processing image for experimental work using mean filter technique.

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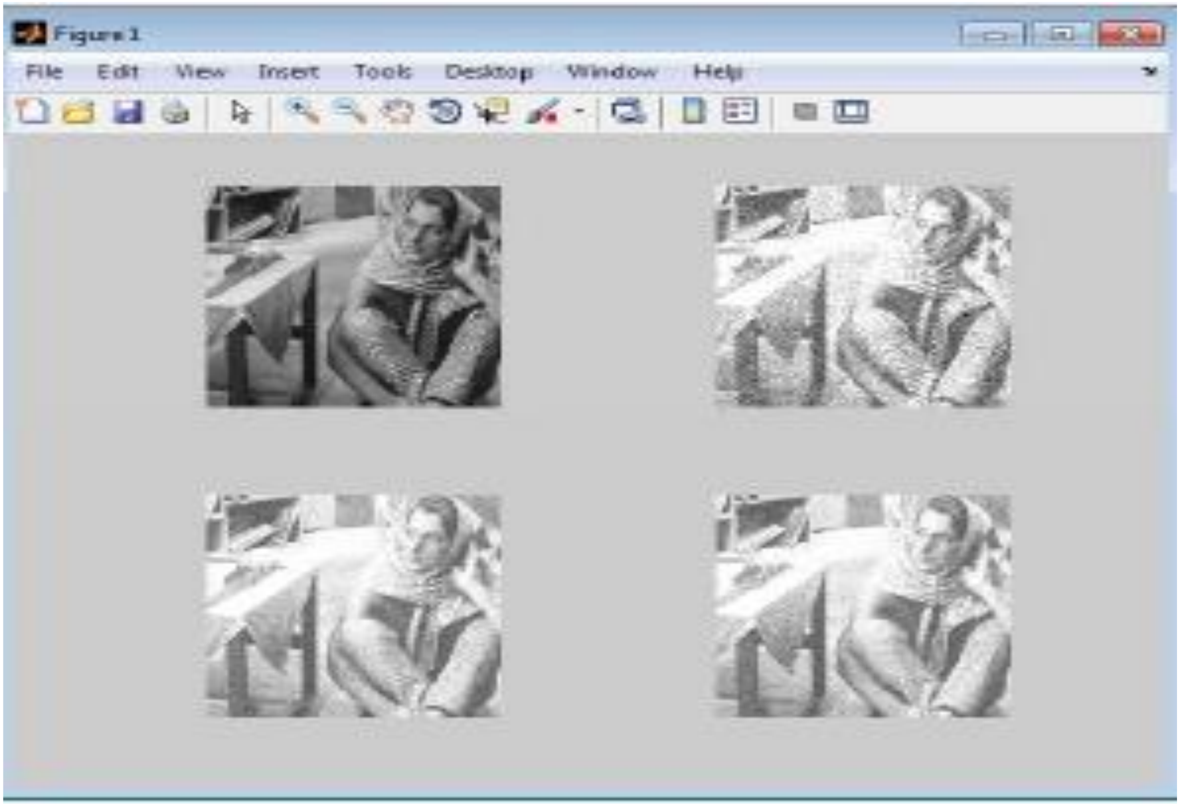

Fig. 6: This picture presents the barbara processing image for experimental work using wavelet technique

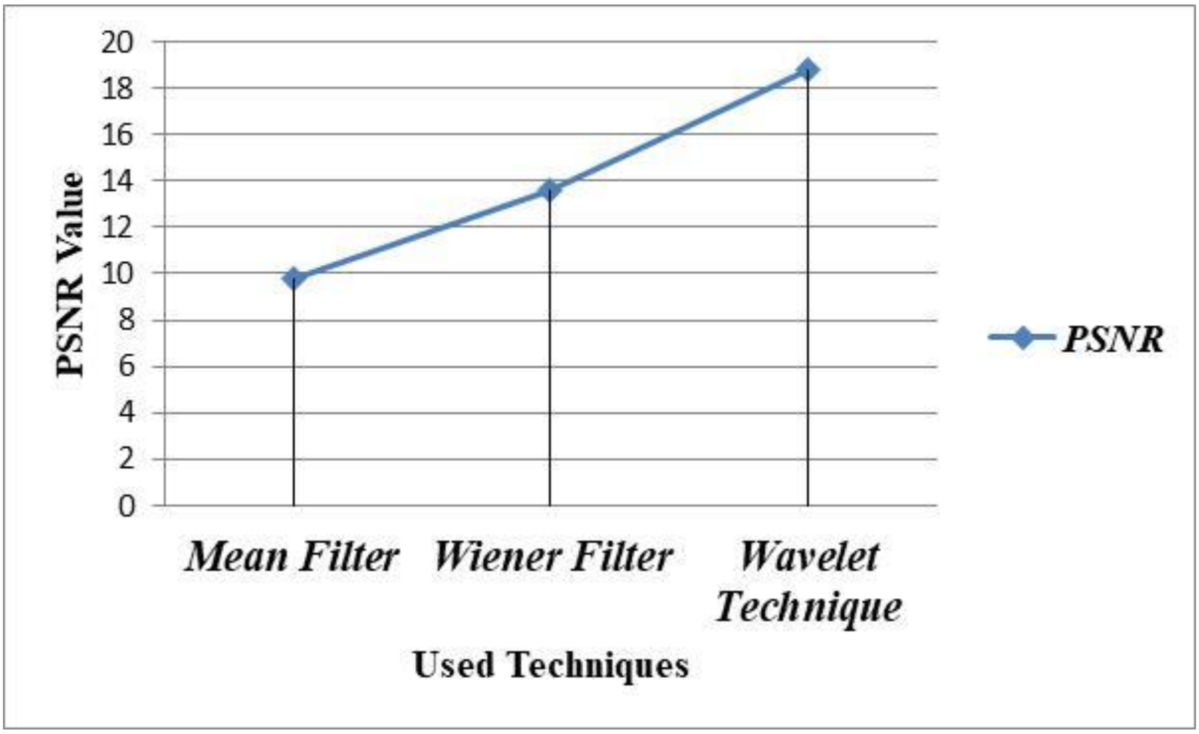

Fig. 7: The above figure shows the comparative study between the image denoising techniques with barbara input image.

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V. Conclusion

Image processing is a field that continues to grow, with new applications being developed at an ever increasing pace. It is a fascinating and exciting area with many applications ranging from the entertainment industry to the space program. Experimental results showed capability of proposed method to remove noise in terms of PSNR and visual quality. The experimental results show the mean with the traditional denoising methods, the proposed threshold-based denoising digital image denoising algorithm for digital image denoising is relatively clear, especially in the more noise, more complex cases", can show its good performance in the terms of better PSNR.

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