High Noise Density Median Filter Method for Denoising Cancer Images Using Image Processing Techniques

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Abstract:
Noise is a serious issue. While sending images via electronic communication, Impulse noise, which is created by unsteady voltage, is one of the most common noises in digital communication. During the acquisition process, pictures were collected. It is possible to obtain accurate diagnosis images by removing these noises without affecting the edges and tiny features. The New Average High Noise Density Median Filter. (HNDMF) was proposed in this paper, and it operates in two steps for each pixel. Filter can decide whether the test pixels is degraded by SPN. In the first stage, a detector identifies corrupted pixels, in the second stage, an algorithm replaced by noise free processed pixel, the New average suggested Filter produced for this window. The paper examines the performance of Gaussian Filter (GF), Adaptive Median Filter (AMF), and PHDNF**.** In this paper the comparison of known image denoising is discussed and a new decision based weighted median filter used to remove impulse noise. Using Mean Square Error (MSE), Peak Signal to Noise Ratio (PSNR), and Structure Similarity Index Method (SSIM) metrics, the paper examines the performance of Gaussian Filter (GF), Adaptive Median Filter (AMF), and PHDNF. A detailed simulation process is performed to ensure the betterment of the presented model on the Mini-MIAS dataset. The obtained experimental values stated that the HNDMF model has reached to a better performance with the maximum picture quality. images affected by various amounts of pretend salt and paper noise, as well as speckle noise, are calculated and provided as experimental results. According to quality metrics, the HNDMF Method produces a superior result than the existing filter method. Accurately detect and replace salt and pepper noise pixel values with mean and median value in images. The proposed method is to improve the median filter with a significant change.
Keywords:
Denoising, Wiener Filter (WF), Gaussian Filter (GF), Pixel Density Based Trimmed Median Filter (PDBTMF), High Noise Density Median Filter (HNDMF)

1. INTRODUCTION

Image denoising in image processing has been the subject of numerous studies. Digital image processing is the process of a digital computer receiving and analyzing visual data. Noise, in general, degrades image quality, resulting in the loss of important details and the degradation of key features and textures. [1] The term "noise" refers to any unwanted or random phenomenon that can degrade an image, distort its original content, and make any preprocessing step more difficult.[2] Traditional spatial filtering methods include median filtering, Gaussian filtering, mean filtering, and bilateral filtering, while the spatial domain technique analyses image pixels directly. The annoying problem in image processing is noise. It leads to random changes in an image so that the original value fluctuates to different values. The purpose of the study is to examine the effects of divergent resolution and noise levels on images. Many filters are designed to reduce or eliminate the impulse noise close to the original picture. Different researchers have made extensive efforts in terms of the reduction and removal of impulse noise. The median filter approaches or algorithms contribute to the removal or reduction of impulse noise. Median algorithms have their strengths and weaknesses which require further research to bring about further improvements in this field of research. Several structural measures of different filters using mean square error (MSE), peak signal to noise ratio (PSNR), and structural similarity index (SSIM). In this section, some traditional image noise reduction algorithms are analyzed and describe to achieve denoising, these algorithms employ a variety of filtering approaches. Overall, different denoising approaches have varied strengths and shortcomings in terms of noise removal. Dong presented the Feature-guided Denoising Convolutional Neural Networks (FDCNN) for ultrasound pictures. To eliminate noise while maintaining critical feature information, and to produce high-quality denoising results, a hierarchical denoising framework for medical images, driven by a feature masking layer was used. This hybrid technique is empirically evaluated on a variety of photos, including real-world images from the United States, simulated renal images, and synthetic images. According to qualitative and quantitative assessments, the suggested hybrid method reduces speckle-noise better than WNNM-based DLRA, SAR-BM3D, and OBNLM methods for US pictures. In addition, this technique preserves edge and structure information better than previous speckle-noise reduction algorithms.[4]

Shakil compared the performance of eight different denoising filtering algorithms based on RMSE, PSNR, MAE, and SSIM for four of the most detrimental noises: speckles, salt and pepper, Poisson, and Gaussian. All of these noises and filtering methods are applied to the three most often used medical images, which are US, CT, and MR. Performance is evaluated using both statistical and visual-qualitative methods. According to the data, the Gaussian filter is the best for despeckling US, CT, and MRI images. When it comes to salt and pepper noise, the median filtering technique outperforms all US, CT, and MRI pictures. For minimizing Poisson noise in medical imaging, anisotropic diffusion filtering is preferred (US, CT, MRI). Finally, it appears that the nonlocal means filtering technique is the most effective at removing Gaussian noise from US, CT, and MRI images.[6]

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Tudor proposed number of iterations (N) required is typically minimal, but it depends on the size of the processed image and the intensity of quantum noise. Comparisons have also been made, with positive findings. The smoothing method here beats both standard restoration schemes, such as the 2D Median filter and several second-order PDE-based denoising models, such as Total Variation (TV) methods for Poisson noise, yielding better results. However, they are not working on the complete brain image database. The results depend on denoising tests performed on 154 pictures of brain tumours that had been damaged with varying quantities of quantum noise and then restored using the proposed method.[7]

2. METHODS AND TECHNIQUES

The overall architecture for image denoising is as shown in Fig .1

Fig 1. Architecture of High Noise Density Median Filter

In this scenario, the input is a corrupted image, and the damaged pixel in the input image is located using a technique known as two-phase detection. During the filtering stage, the High-Density Noise median filtering technique is employed to filter and identify random pixels. It produces a noise-free image as an output image. The initial stage of this method is the detection of corrupted pixels in the input image. Some known methods for detecting noisy pixels include the normalization approach, rank-ordered logarithmic difference, rank-ordered absolute difference, and robust ratios. An algorithm for noise removal is composed of noise recognition and removal steps. Rank order threshold, fuzzy reasoning, neural networks, and other algorithms are used in the recognition of impulse noise..During this phase, faulty pixels are removed. This is a median-based technique done with pixel correlation, in which the median value of neighboring pixels replaces the faulty pixels. When the noise density is high, the pixels in the surrounding area are likewise noisy. So, in such situations, absolute difference is used for the estimation of noise density.

3. DENOISING FILTERS

A. Wiener Filter

As a spatial domain linear filter, the Wiener filter is used to restrict the amount of noise in an image by comparing it to the desired noiseless signal estimate. There is an assumption of stationary linear stochastic processes of image and noise with known spectral characteristics or auto- and cross-correlation, the filter must be physically realizable and causal, and the filter's performance is evaluated by minimum mean-square errors (MMSE).[5] Filtering is based on statistical methods. Inverse filtering is a restoration approach for deconvolution that is extensively employed in deconvolution. Recovering a blurred image with inverse filtering (or modified inverse filtering) requires high sensitivity to additive noise. As a result of the Wiener filter, noise smoothing and inverse filtering are assured. It inverts the blurring and removes the additive noise at the same time. In addition to destroying tiny visual details, the Wiener filter also blurs sharp edges and performs poorly in the presence of signal-dependent noise.

B. Gaussian Filter

Peak detection is the basis of Gaussian filtering. This assumes that peaks are impulses. In addition, the fact that this filter corrects the spectral coefficient in question, as well as all the amplitude spectrum coefficients inside its window, makes it valuable. Since the pixels near the edge have higher relevance in this filter, edge blurring is reduced. Also, this filter has a variable degree of smoothing, as well as being computationally efficient.

C. Existing algorithm (PDBTMF)

Here, pixel density-based trimmed median filter (PDBTMF) was proposed and its works in two stages for each pixel. In the first stage, this filter can decide that the test pixel is degraded by SPN or not. This filter can check whether the identified corrupted pixel is noisy or not by verifying all the pixels current in the selected mask for the identified corrupted pixel. When the test pixel is 255 and the selected 33% window contains the maximum number of pixels, this filter can treat the current pixel 255 as non-noisy. The overall steps are listed in the next section, algorithm, and a flowchart is also provided in Fig. 1 for easier reading.
The proposed denoising scheme's algorithm and flowchart Proposed PDBTMF algorithm The following are the steps involved in the pixel density-based trimmed median filter (PDBTMF):

PDBTMF The pixel density-based trimmed median filter (PDBTMF) has the following steps:
Input noisy image: N = (N (i; j)) consisting of pixels N (i, j).
Restored image: P (i, j).
Stage 1. Read the input noisy image for all i and j in image.
Stage 2. Select the test pixel N (i, j), If the pixel N (i, j) = 0 or 255 means N (i, j) is said to be a corrupted pixel then the pixel, N (i, j) as center element, Select a 2D 3×3 window.
Stage 2.1. If all nine samples in the window mask of size 3×3 are 0 and 255 only, then the following two cases are possible else step 2.2.
Case 1: If N (i, j) = 0, and at least six samples in that window mask are 0, the test pixel is N (i, j) treated as noncorrupted pixel and present pixel is unaffected, i.e., 0. Else, mean of the nine elements is calculated and replace the mean value to the current processing pixel N (i, j).
Case 2: if N (i, j) = 255, and at least six samples in that selected window mask are 255, the test pixel is N (i, j) treated as non-corrupted pixel and present pixel is unaffected i.e., 255. Alternatively, calculate the average of the nine elements and replace it with the processing pixel N. (i, j).
Stage 2.2. The following two scenarios are possible if nine of the samples in the chosen window mask are not 0 and 255.
Case 1: if at least 1 pixel in the selected 3×3 window N (i, j) has satisfies the condition that $0<N(i, j)<10$ or $245<N(i, j)<255$, then following i, ii, iii steps are possible, else
case 2.
i. Find the most recurrent pixels in that particular window mask.
ii. Determine the median value of those most often occurring pixel values; Replace the current processing pixel N with the obtained median (i, j)

Case 2: Calculate the median value of the remaining elements existing in the specified window, replace the current processing pixel N I j) with the calculated median value, and delete the complete pixel having the pixels values as 0 and 255 in this chosen window mask.
Stage 3. Otherwise, if 0<N (i, j) <255, The processed/test pixel is then handled as an uncorrupted pixel while maintaining the test pixel's value.

4. METHODOLOGY OF PROPOSED ALGORITHM (HNDMF)

This section explains the proposed algorithm for noise removal, which is the New Average high noise density median Filter. A 3*3 window is selected from the image, and the processing pixel is examined in the selected 3X3 window to see if the processing pixel is degraded by the noise or not. The New Average high noise density median Filter. (HNDMF) was proposed in this paper, and it operates in two steps for each pixel. filter can decide whether the test pixels is degraded by SPN. In the first stage, a detector identifies corrupted pixels, in the second stage, an algorithm replaced by noise free processed pixel, the New average suggested Filter produced for this window. When the computation pixel's pixel value is between the image's maximum and minimum grey level values, it is referred to as a non-noisy/noise free pixel; otherwise, it is referred to as a noisy pixel. If the processing pixel is found to be noise-free, it is ignored. The noisy image is denoted by Pn (i.j), while the restored image is denoted by Re (i,j).The **(HNDMF)**Proposed Filter's different phases are discussed in detail below.

Step 1: Read the input noisy image Pn (i, j)

Step 2: Select a processing pixel Pn_{ij}; if this processing pixel is $0 < Pnij < 255$, it is considered a non-noisy pixel, and Pn_{ij} is left unchanged; otherwise, step 3 is performed.

Step 3: Pn_{ij} serves as the processing pixel as well as the center element, Choose a 2D 3*3 window

Step 4: Pn_{ij} is a degraded pixel, when Pn_{ij} value is 0 or 255 then then the following two instants are possible. These two cases are depending on the all the elements present in the selected window.

Case a): The selected 3*3 window contains 0's and 255's only, then Pn_{ij} can be replaced with the mean of the all the elements in the 3*3 window.
Case b): The selected 3*3 window contains not only 0's and 255's and other values too, then eliminate the 255's and 0's present in the window and replace the Pn_{ij} with the average of mean and median value calculated for the outstanding elements present in the window.

Step 5: repeat steps 1 to 3 until and unless all the pixels that are present in the image are covered further to get restored image K (i, j) On all the pixels in the original image, the input present pixel Pn_{ij} is verified for the Min or Max pixel values, i.e., 0 or 255. This image is related to the large matrix, and values enclosed within a rectangle are to be used as a handling window. As an enclosed element, the processed pixel is represented. The flowchart of the process is shown in Figure 3.

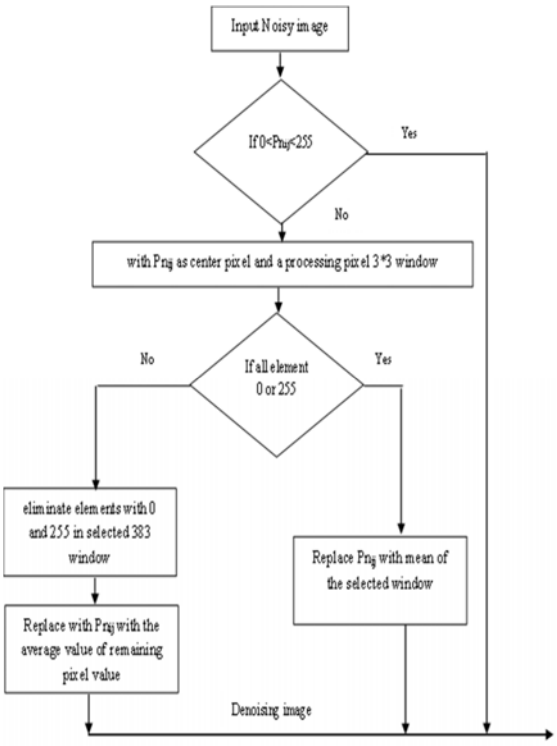


Fig. 2. The Flowchart of HNDMF algorithm

5. ILLUSTRATION OF HNDMF ALGORITHM

Assume that pixel from the image as the selected pixel (i.e., the pixel value is either 0 or 255), and some of the selected pixel's four neighbours are also noisy pixels.Let the processing pixel value is 0 (represented in Red) and check for the neighbors of the processing pixel and arrange them in increasing order.

166	**255**	**255**
255	**0**	**134**
255	**175**	**255**

Fig 3 Representation of noisy pixel

Un-sorted Array: 166, 255, 255, 255, 0, 134, 255, 175, 255

Sorted Array: 0, 134, 166, 175, 255, 255, 255, 255, 255

The processing pixel value in the matrix looks as a noisy one and this can be replaced by the modified HNDMF i.e., mean median average of (134, 166, 175) is158 which changes the degraded pixel value as illustrated in Figure 3.

166	**255**	**255**
255	**158**	**134**
255	**175**	**255**

Fig.4.Representation of noisy pixel to denoised pixel

6. RESULTS AND DISCUSSION

To evaluate the proposed method, a set of research is carried out on some cancer images collected from the database Kaggle Mini-Mammogram Image Analysis Society (MIAS) for breast cancer, data set contains 15 cancer images for testing.

In addition, the results of the proposed method will be compared with the results of various filters on the same images. The implementation was performed on a laptop that has an Intel CPU I7 2.2 GHz with 16 GB of RAM and a Windows 10 operating system. The peak signal-to-noise ratio (PSNR), mean squared error (MSE), and Structure Similarity Index Method (SSIM) performance metrics are used to evaluate the evaluation results on the test images in these experiments.

(i) SIMULATION RESULTS

The noise removal performance of the High Noise Density Median Filter is evaluated for SPN in this paper. The HNDMF results are compared to the existing filters such us Wiener Filter, Gaussian Filter and PDBTMF for cancer image. The basic aspects of the denoising technique are the detection of noisy pixels and the replacement of noisy pixels with noise-free pixels through filtering techniques. The simulation results of this planned method, as well as existing denoising algorithms such as Wiener Filter, Gaussian Filter and PDBTMF for cancer image., are analyzed in this part. To evaluate the denoising system, both subjective and quantitative evaluations are done. benchmark images are used to put the following image processing methods to the test. The outcomes of the various algorithms are checked using images, and the findings are are compared both visually and quantitatively

(ii) IMAGE QUALITY EVALUATION MEASURES

The evaluation measures used to assess the proposed image denoising method are quantitative image quality measures include Mean Square Error (MSE) and Peak Signal to Noise Ratio (PSNR). These measures are computed based on original and denoised images. MSE is a cumulative value of squared errors between an original image (O) and a denoised image (D) with 2D matrices with m rows and n columns. MSE has a small value if the method performs well and can be computed as [10]:

$$MSE = \frac{1}{M * N}\sum_{M,N}[O(m,n) - D(m,n)]^2$$

The second measure is the PSNR that can give a good indication of the capability of the method to remove the noises. The small value of PSNR for the denoised image means it has poor quality [11]. PSNR can be calculated as in the following equation.

$$PSNR - 10log_{10}\left(\frac{R^2}{MSE}\right)$$

The variable in the previous equation is the maximum fluctuation of the image's pixels if the image has a data type of double floating-point, then R is one, and if the image has a data type of 8-bit unsigned integer, then R is 255.

A performance evaluation index is defined using the SSIM index method based on the computation of three major aspects: luminance, contrast, and structural or correlation term. This index is the result of multiplying these three factors together. [12]. Structural Similarity Index Method can be expressed through these three terms:

$$SSIM(x,y) = [l(x,y)]^{\alpha}[c(x,y)]^{\beta}[s(x,y)]^{\gamma}$$

Here, l is the luminance (used to contrast the brightness of two images), c is the contrast (used to vary the series among the brightest and darkest area of two pictures) and s is the structure (used to compare the local luminance pattern between two images to find the similarity and dissimilarity of the images) and α, β, and γ are the positive constants. Again luminance, contrast, and structure of an image can be expressed separately as:

$$l(x,y) = \frac{2\mu_x\mu_y + C_1}{\mu_x^2 + \mu_y^2 + C_1} \quad (1)$$

$$c(x,y) = \frac{2\sigma_x\sigma_y + C_2}{\sigma_x^2 + \sigma_y^2 + C_2} \quad (2)$$

$$s(x,y) = \frac{\sigma_{xy} + C_3}{\sigma_x\sigma_y + C_3} \quad (3)$$

where μ_x and μ_y are the (local) sample means of x and y, respectively, σ_x and σ_y the (local) sample standard deviations of x and y, respectively, and σ_{xy} is the (local) sample correlation coefficient between x and y. If $\alpha = \beta = \gamma = 1$, then the index is simplified as the following form using Equations (1)-(3):

$$SSIM(x,y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2\sigma_y^2 + C_2)}$$

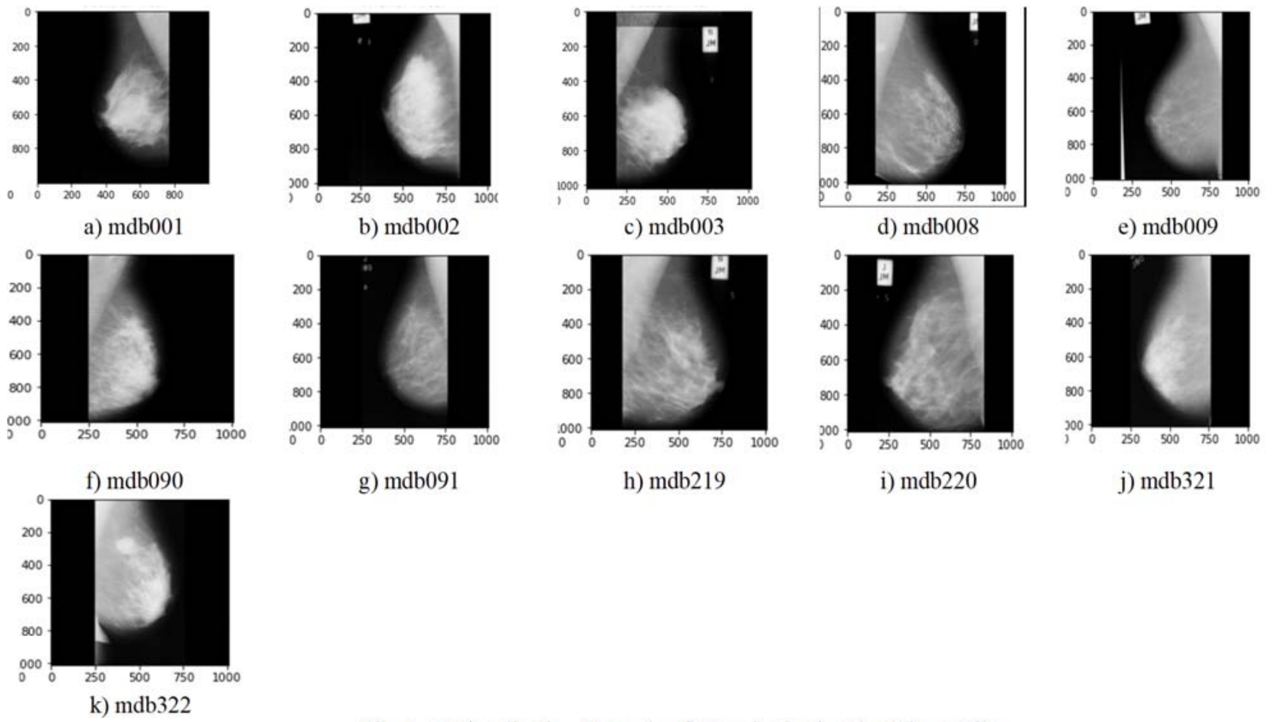


Fig. 5. A Visualization Example of Denoised using the Wiener Filter

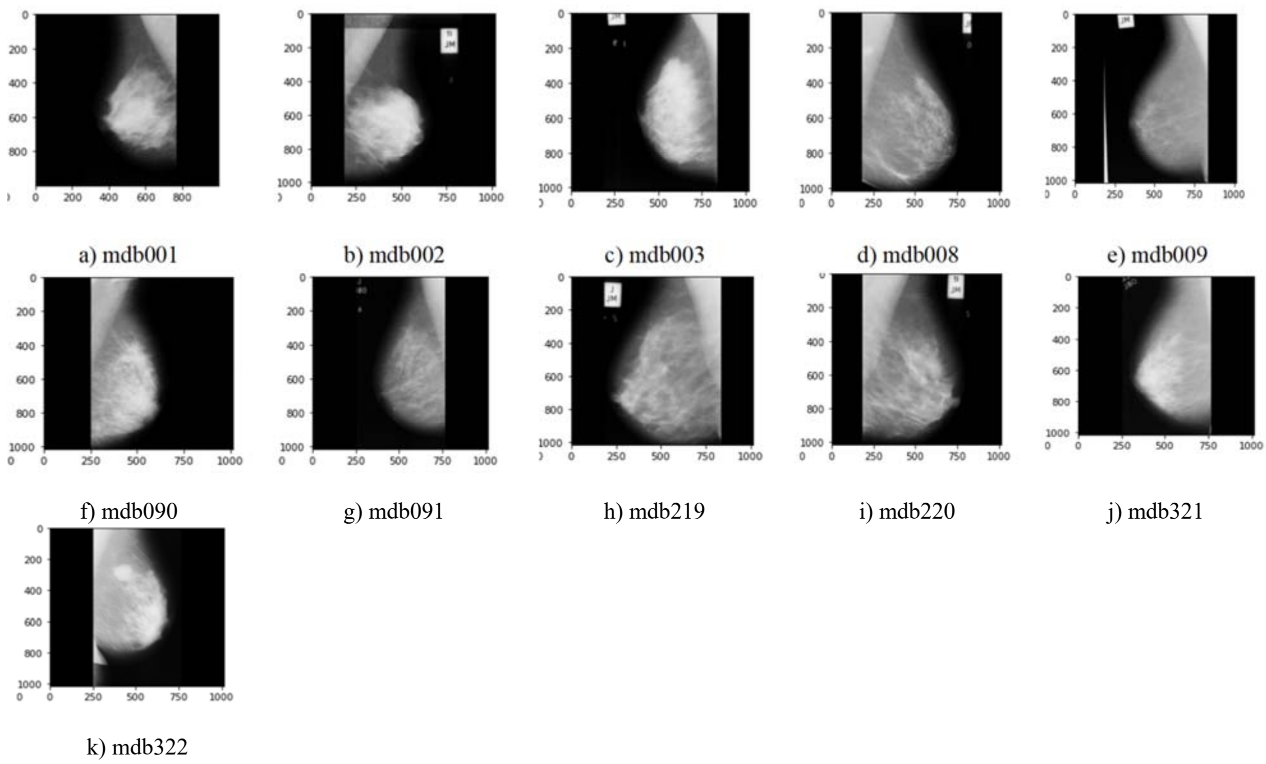
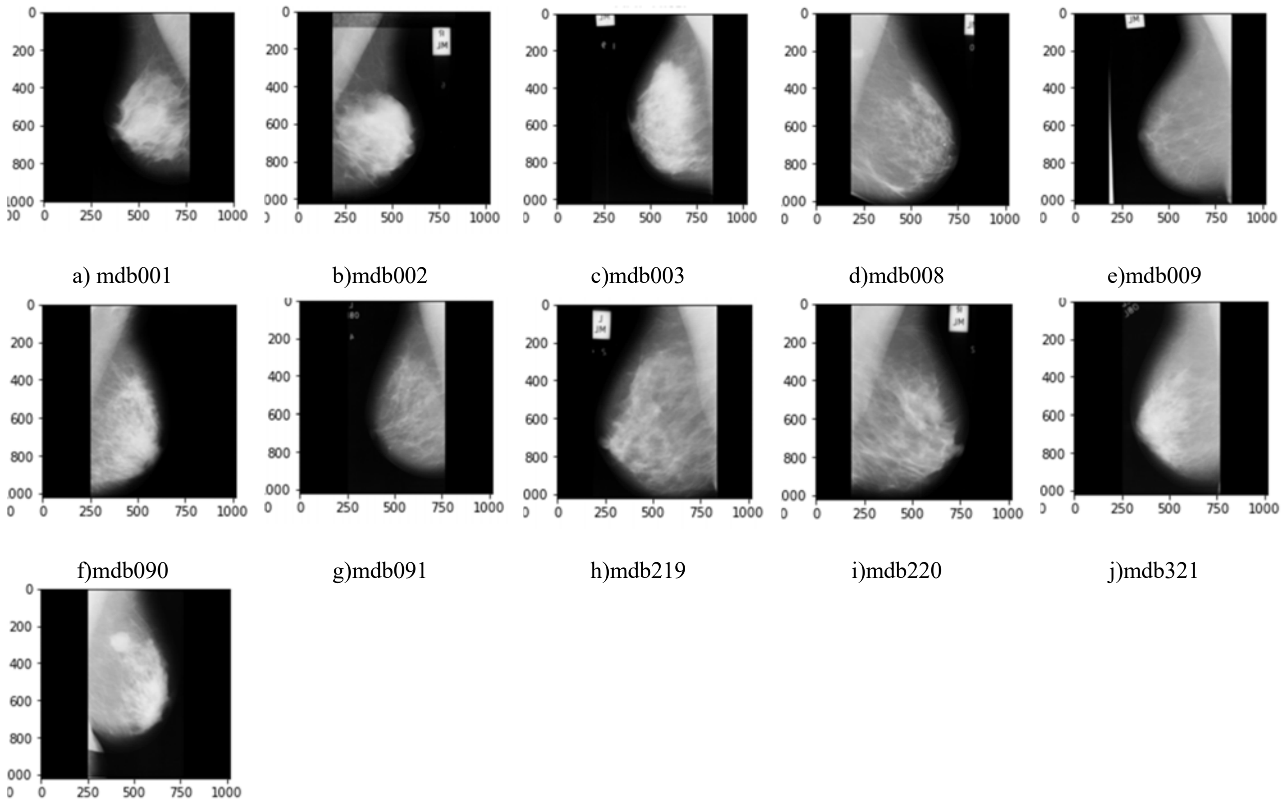


Fig. 6. A Visualization Example of Denoised using the Gaussian Filter

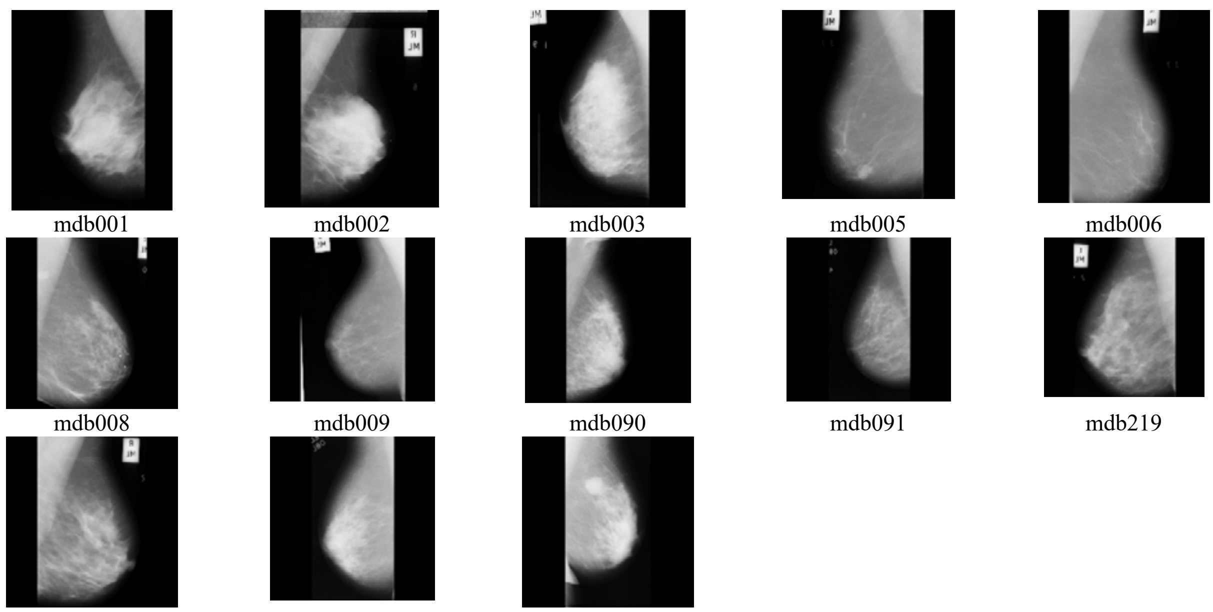


a) mdb001 b)mdb002 c)mdb003 d)mdb008 e)mdb009

f)mdb090 g)mdb091 h)mdb219 i)mdb220 j)mdb321

k)mdb322

Fig. 7. A Visualization Example of Denoised using the PDBTMF Filter



mdb001 mdb002 mdb003 mdb005 mdb006

mdb008 mdb009 mdb090 mdb091 mdb219

mdb220 mbd221 mdb222

Fig. 8. A Visualization Example of Denoised using the HNDMF Filter

TABLE 1. COMPARISON RESULTS OF MSE MEASURE FOR WIENER FILTER, GAUSSIAN FILTER, PDBTMF AND HNDMF METHODS

Image Name	Wiener Filter	Gaussian Filter	PDBTMF	HNDMF
mdb001.jpg	1.2908	0.42915	1.2918	0.0410
mdb002.jpg	2.7634	0.96126	2.7671	0.0703
mdn003.jpg	3.1118	1.09758	3.11557	0.01315
mdb008.jpg	2.7187	0.96700	5.8072	0.07210
mdb009.jpg	5.792	2.13475	2.7237	0.02740
mdb090.jpg	0.8999	0.4179	0.8991	0.01727
mdb091.jpg	1.7060	0.4964	1.7086	0.04052
mdb219.jpg	3.6985	1.1550	3.7055	0.07022
mdb220.jpg	2.6801	1.01028	2.6841	0.08202
mdb321.jpg	2.000	0.5527	2.0062	0.04081
mdb322.jpg	1.3316	0.6071	1.3329	0.2183

MSE (Mean Square Error) is a quality checking parameter that indicates how close the filtered output is to the input image. The smaller the MSE value, the closer will be the fitness of input and filtered output images. The experimental analysis reveals that HNDMF posses the lowest MSE values so is the best noise removing filter among other filters.

TABLE 2. COMPARISON RESULTS OF PSNR MEASURE FOR WIENER FILTER, GAUSSIAN FILTER, PDBTMF AND HNDMF METHODS

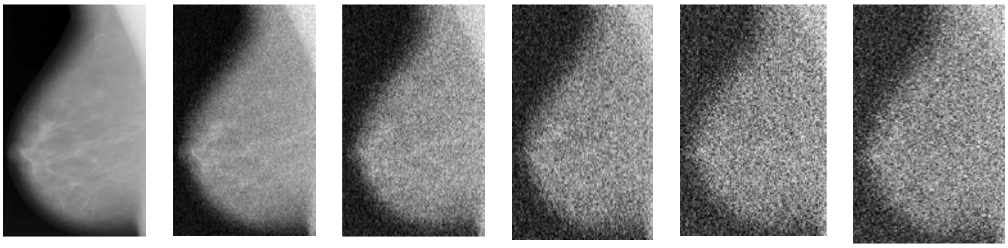
Image Name	Wiener Filter	Gaussian Filter	PDBTMF	HNDMF
mdb001.jpg	41.1965	44.9111	41.2185	51.9218
mdb002.jpg	38.7054	41.023	38.7090	50.2941
mdn003.jpg	39.8402	42.829	39.8641	50.8052
mdb008.jpg	38.3454	41.4589	39.6890	50.1892
mdb009.jpg	39.6280	42.339	38.3601	49.5464
mdb090.jpg	40.37031	43.9545	40.3687	52.9848
mdb091.jpg	41.0374	44.4622	41.035	51.3029
mdb219.jpg	38.0966	41.6296	38.098	50.5856
mdb220.jpg	38.3197	41.6519	38.3278	49.8785
mdb321.jpg	41.1337	44.1675	41.1355	51.2816
mdb322.jpg	40.9792	44.5848	40.9751	52.6051

PSNR (Peak Signal-to-Noise Ratio) is a ratio between the maximum possible value and the value of corrupting noise of a signal that influences the quality of its representation. It is proved that a filter having a higher PSNR value is considered to be the best filter. Performance analysis shows that among the four filters HNDMF has a high PSNR value.

TABLE 3. COMPARISON RESULTS OF SSIM MEASURE FOR WIENER FILTER, GAUSSIAN FILTER, PDBTMF AND HNDMF METHODS

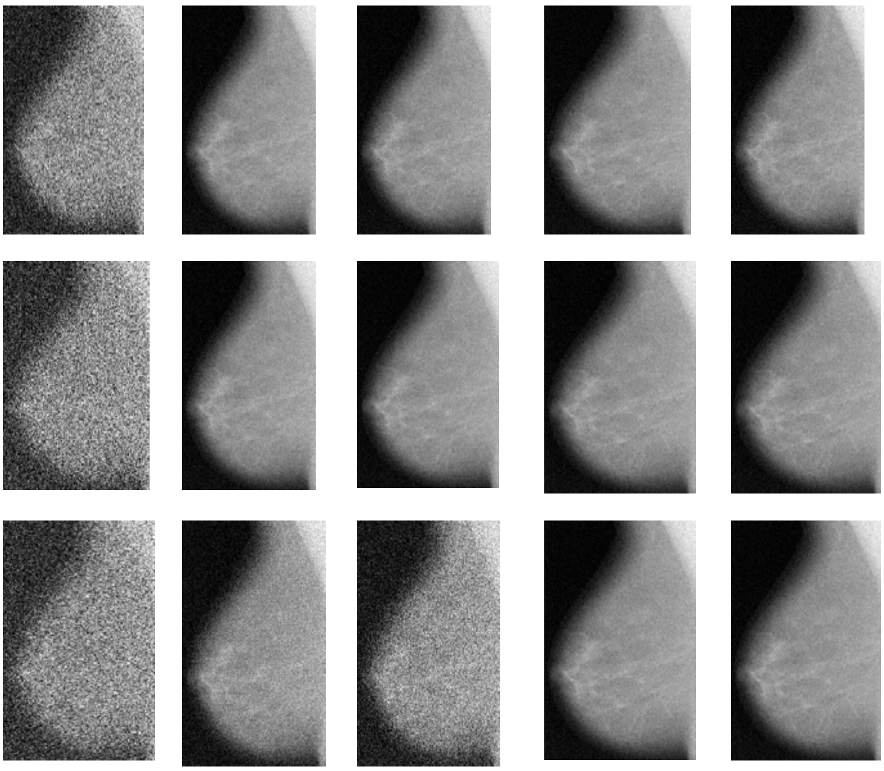
Image Name	Wiener Filter	Gaussian Filter	PDBTMF	HNDMF
mdb001.jpg	0.9641	0.9797	0.9654	0.9987
mdb002.jpg	0.93786	0.9609	0.93873	0.9992
mdn003.jpg	0.9468	0.9673	0.94869	0.9992
mdb008.jpg	0.9345	0.9649	0.94169	0.9981
mdb009.jpg	0.9374	0.9619	0.9364	0.9981
mdb090.jpg	0.9638	0.9789	0.9643	0.9989
mdb091.jpg	0.9606	0.9787	0.9609	0.9987
mdb219.jpg	0.9320	0.9647	0.9325	0.9982
mdb220.jpg	0.9376	0.9657	0.9384	0.9989
mdb321.jpg	0.9617	0.9788	0.9617	0.9989
mdb322.jpg	0.9704	0.9826	0.9705	0.9989

The Structural Similarity Index (SSIM) is a metric for comparing the similarity of two images. The resulting SSIM index is a decimal value of -1 to 1, and only for two equivalent data sets is the value 1 reachable, indicating the perfect structural similarity. No structural similarity is indicated by a value of 0. Performance analysis shows that among the four filters HNDMF has a better SSIM value. In Figures 9 and 10, the first column represents the output of Wiener Filter, the second column shows the output of the Gaussian Filter, the third column shows the output of the PDBTMF, while the outcome of the Proposed System is represented in the fifth column (HNDMF). The measurable procedures are shown in Tables 4 and 5.



(a) (b) (c) (d) (e) (f)

Figure 9: (a)Original Breast Cancer image. (b) Image corrupted by 20% noise density. (c) Image corrupted by 40% noise density. (d) Image corrupted by 60% noise density. (e) Image corrupted by 80% noise density. (f) Image corrupted by 90% noise density.



(a) (b) (c) (d) (e)

Figure 10: Results of different filters for Breast Cancer image. (a) Noise image (b) Output of **Wiener Filter**. (c) Output of **Gaussian Filter**. (d) Output of PDBTMF. (e) Output of HNDMF. Row 1–Row 3 show processed results of various filters for BreastCancer.jpg image corrupted by 60%, 80%, and 90% noise densities.

TABLE :4 PSNR and MSE for different filters for Breast image at different noise densities.

	PSNR				MSE			
Pixel Density	**Wiener Filter**	**Gaussian Filter**	**PDBTMF**	**HNDMF**	**Wiener Filter**	**Gaussian Filter**	**PDBTMF**	**HNDMF**
20%	30.2876	33.9222	39.3296	51.9329	1.2807	0.42817	1.2815	0.0416
40%	27.8165	30.1348	27.8191	50.2932	2.7533	0.95125	2.7576	0.0712
60%	28.9513	31.9393	28.9752	50.9051	3.1217	1.08757	3.2153	0.1037
80%	27.3454	31.4588	28.6891	50.1881	2.7288	0.95701	5.7071	0.0733
90%	28.6280	31.3392	27.3602	49.5454	3.7826	1.5347	2.6236	0.1182

TABLE :5 SSIM for different filters for Breast image at different noise densities.

Pixel Density	Wiener Filter	Gaussian Filter	PDBTMF	HNDMF
20%	0.9752	0.9898	0.9765	0.9978
40%	0.9489	0.9719	0.9498	0.9994
60%	0.9579	0.9784	0.9597	0.9984
80%	0.9456	0.9759	0.9527	0.9982
90%	0.9485	0.9718	0.9475	0.9983

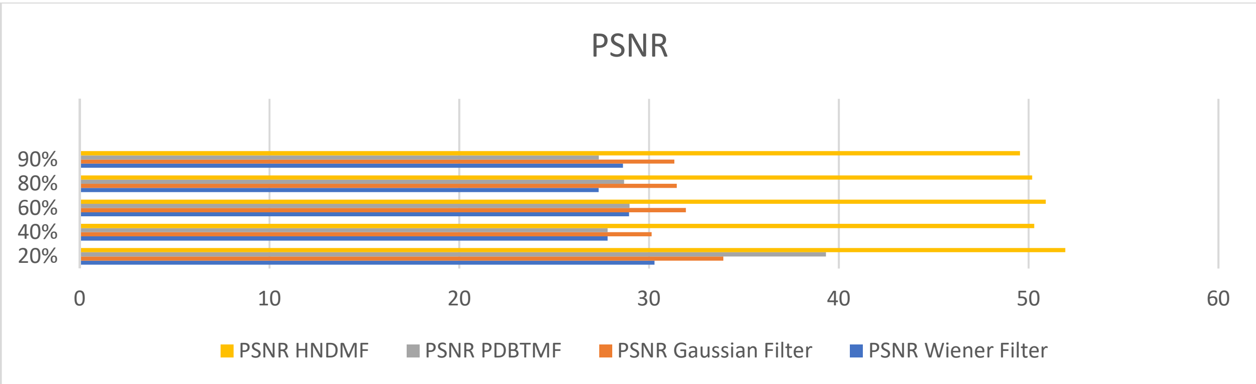


Fig 11. Graphical represent of PSNR values(Different pixel density)

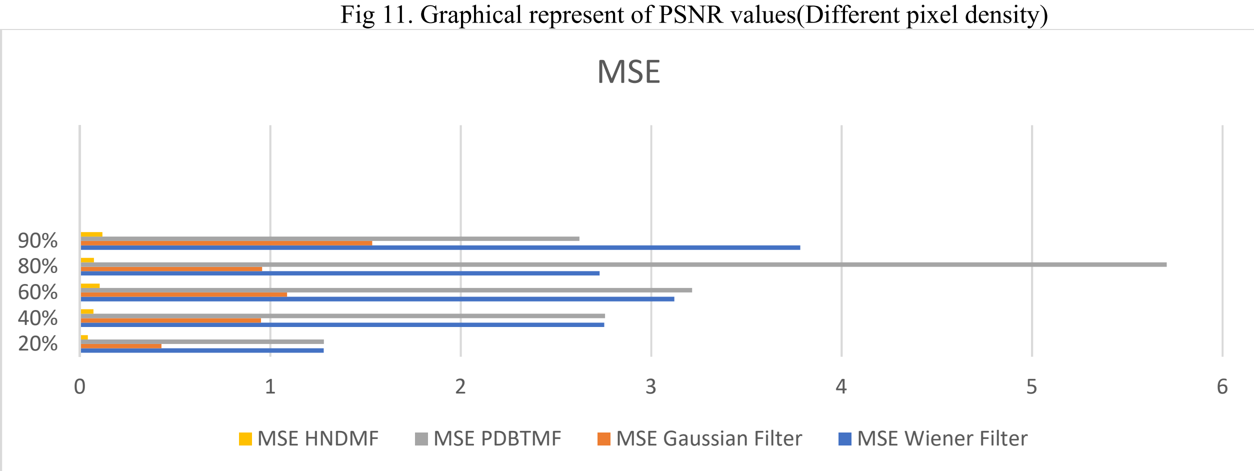


Fig 11. Graphical represent of MSE values(Different pixel density

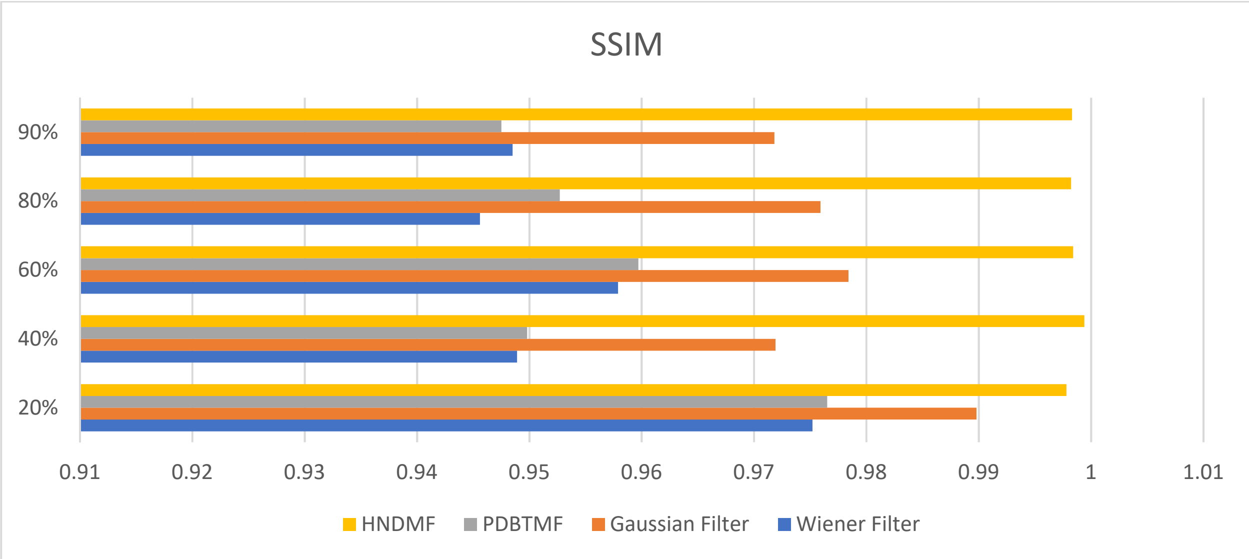


Fig 12. Graphical represent of SSIM values(Different pixel density)

7. CONCLUSION AND FUTURE WORK

For noise removal in medical images, the High Noise Density Median Filter (HNDMF) is proposed.. It has been observed that PDBTMF can remove low-to-intermediate density impulsive noise. When the noise level exceeds 50%, their performance suffers, and their computing complexity rises as well. In some cases, the pixel value appears as a noisy pixel but is not always noisy, such as when an image distorted by an SPN displays 0 and 255 as noisy pixels but is not always noisy. To address this issue, the suggested algorithm HNDMF decides if the current pixel is degraded or not, regardless of whether the pixel value is 0 or 255. In this proposed HNDMF approach, a 3 x 3 window is used as the processing pixel as a centre element, and similar pixels in the window are searched for. This technique is effective for low- to high-density impulse noise levels. The suggested system used in breast cancer images. In the MIAS dataset, HNDMF clearly showed good results in the elimination of SPN in grayscale when compare with other images. The suggested HNDMF produces superior results when compared to existing approaches such as Wiener, Gaussian, and PDBTMF.The proposed technique, HNDMF, has a high PSNR, a low MSE, and an improved SSIM.further we implemented this method in Machine Learaning Techniques to clean large data.

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