

# **A Review Paper of MRI Brain Image for Various Types of Noise Removal in Different Filters**

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**ABSTRACT:** In an advanced imaging technique Magnetic Resonance Imaging (MRI) plays a major role in medical setting to create high standard images contained in the human brain. MRI imaging is often used when treating brain, prostate cancers, ankle and foot. The MRI images captured are usually liable to suffer from Gaussian noise, salt and pepper noise; speckle noise etc., Therefore obtaining of brain image with accuracy is very difficult task. An accurate brain image is very indispensable for further diagnosis process. Image processing algorithms are applied to the captured MRI data and detach the noise, thus preserves the integrity of fine medical image structure. In this paper, various filtering algorithms are discussed and compared.

**KEYWORDS:** MRI brain image, wiener, mean, median, image processing.

## **I. INTRODUCTION**

Magnetic Resonance Imaging (MRI) has become a widely used method of high quality medical imaging, especially brain imaging where MRI's soft tissue contrast and noninvasiveness is a clear advantage [1]. MRI provides a perfect view inside the human body. The level of details we can see is remarkable on being evaluated with other imaging modality. MRI is a medical imaging technique that measures the response of atomic nuclei of body tissues to high frequency radio waves when placed in a strong magnetic field and that produces images of the internal organs [2]. MRI differs from other modalities like X-ray, Computed Tomography in such manner that it can characterize and discriminate among tissues using their biochemical and physical properties. Also, without moving patient it can produce sectional image of equivalent resolution. This adds to its flexibility and diagnostic utility which gives it special advantage for surgical treatment planning [3]. X-ray is fundamentally used to exhibit neurotic or other physiological varieties of living tissues and is a regularly utilized type of medicinal imaging. In light of the determination of MRI and the innovation being basically safe it has risen as the most precise and attractive imaging innovation. X-ray imaging is regularly utilized while treating cerebrum, prostate diseases, lower leg and foot. It can likewise be utilized for recognizing illnesses, for example, Parkinson's, Alzheimer's, mind tumors and stroke [4] [5]. In spite of noteworthy upgrades as of late, attractive reverberation (MR) pictures regularly experience the ill effects of low Signal to Noise Ratio (SNR) particularly in cerebrum imaging.

## **II. LITERATURE REVIEW**

B Deepa et al. [1], Noise removal techniques have become an essential exercise in medical imaging applications, for the study of anatomical structures. The most commonly affected noises in medical image are salt and pepper, Gaussian, Speckle and Brownian noise. In this paper, the medical images taken for comparison include MRI brain images, in gray scale and RGB.

Babu G et al. [2], Noise is an ingrained phenomenon in the medical images which may increase the root mean square error and reduce the peak signal to noise ratio. NLM filter is used for the removal of speckle noise and shrinkage rule is used to shrink the content of noise present in the brain images by means of the thresholding technique.

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Priyanka Punhani et al. [3], Magnetic Resonance Imaging is most popularly used techniques in clinical diagnosis. During acquisition, image quality is degraded by certain noise and artifacts. Due to which, it is difficult to interpret important details of user. So it becomes necessary to denoise image. There are various denoising methods available now days.

L. Ramya et al. [4], Image Denoising and Image Segmentation are the two major areas of the medical image processing. The main objective of this paper is to develop a robust segmentation algorithm in order to detect tumor in 2D MRI brain images. Here we use image denoising as the pre-processing step as noise plays an important role in case of accuracy of affected area of the image, especially in medical diagnostics.

### III. VARIOUS FILTER

#### KSL Filter:-

One of the filtering algorithms is KSL filtering algorithm. KSL is nothing but it is the combination of kernel, sobel and low pass filter. Apply the part channel to the MRI cerebrum picture, where portion lattice is connected to each pixel in the picture. The qualities have been increased; the pixel is changed with SOP. By choosing different portions, distinctive sorts of sifting can be connected. This gives LPF and HPF utilizing a bit. Next go through sobel channel which performs 2-D spatial inclination estimation on a picture. Separated picture is going through LPF which is most appropriate for smoothing of a picture. This has a tendency to hold the low recurrence data with in a picture. The KSL separating system for MRI is executed in MATLAB and tried with various engineered and genuine clinical pictures this outcome in clamor evacuation in various sorts of MRI pictures like low SNR MRI, mostly parallel MRI et cetera.

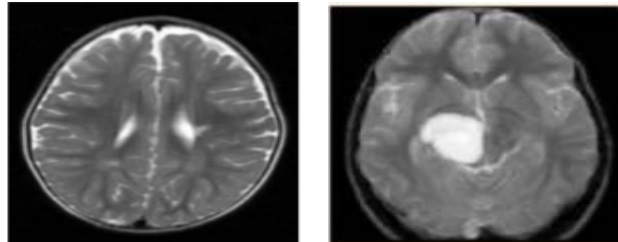


Figure 1: Original image, image after KSL filtering

#### Median Filter:-

Median separating is a nonlinear technique used to expel commotion from MRI mind images. It is especially powerful at expelling salt and pepper clamor. Middle channel works by traveling through the picture pixel by pixel, replacing each incentive with the middle benefit of neighboring pixels. The pixel is computed by first arranging all the pixel esteems from the example of neighbors into numerical request, and after that supplanting the pixel being considered with middle pixel esteem. Middle channel is better ready to evacuate clamor without decreasing the sharpness of the picture.

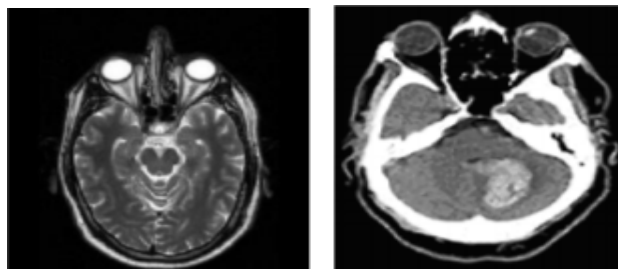


Figure 2: Original image, image after Median filtering

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## Wiener Filter:-

Wiener filter is help through an ideal between reverse separating and clamor smoothing. It evacuates added substance commotion and deburring simultaneously. This turns out to be ideal in diminishing the general Mean Square Error (MSE). The operation includes two sections. One is reverse separating and the other is clamor smoothing. Wiener channels have a place with a sort of ideal direct channels with the loud information as information which includes the computation of distinction between the coveted yield arrangements from the real yield. The execution can be measured utilizing Minimum Mean-Square Error.

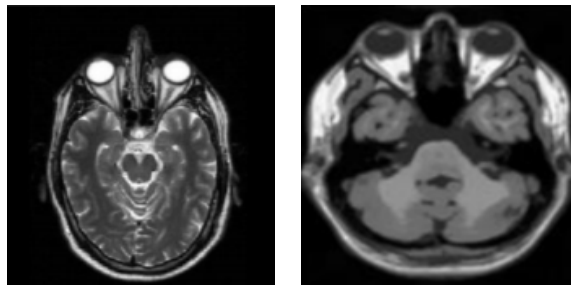


Figure 3: Original image, image after Wiener filtering

Wiener2 is a 2-D versatile commotion expulsion channel. The wiener2 work applies a wiener channel which is a kind of direct channel to a picture adaptively, fitting itself to nearby picture difference. Where the fluctuation is vast, wiener2 performs small smoothing. Where the fluctuation is little, wiener2 performs all the more smoothing. This approach frequently creates preferable outcome over direct sifting. The versatile channel is more particular than a practically identical direct channel, protecting edges and other high recurrence parts of a picture. What's more, there are no outline errands ; the wiener2 work handles every preparatory calculation, and actualizes the channel for preparatory calculations, and executes the channel for an info picture. Best appropriate to evacuate Gaussian commotion.

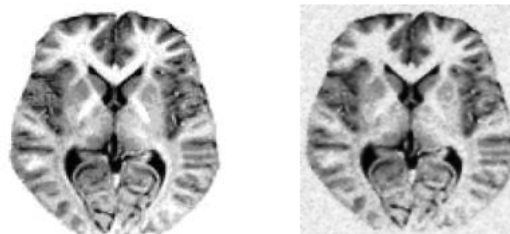


Figure 4: Original image, image after adaptive filtering

## Mean Filter:-

Mean channel is the ideal channel for evacuating grain clamor in a picture. It is a direct channel that applies veil over every pixel in the flag. Each of the parts of the pixels going under cover are found the middle value of together to shape a solitary pixel that is the reason the channel is also called normal channel and is given by

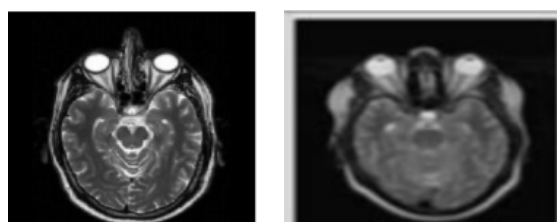


Figure 5: Original image, image after mean filtering

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Commotion is the undesirable impacts delivered in the picture. Amid picture securing or transmission, a few components are in charge of presenting clamor in the picture. Contingent upon the sort of aggravation, the commotion can influence the picture to various degree. For the most part our concentration is to expel certain sort of commotion. So we recognize certain sort of commotion and apply distinctive calculations to expel the clamor. Picture clamor can be delegated Impulse commotion (Salt-and-pepper clamor), Amplifier commotion (Gaussian commotion), Shot commotion, Quantization commotion (uniform commotion), Film grain, on-isotropic clamor, Multiplicative commotion (Speckle commotion) and Periodic clamor.

Gaussian Noise (Salt and Pepper Noise):- The term motivation commotion is likewise utilized for this kind of clamor [5]. Different terms are spike commotion, irregular clamor or autonomous commotion. Highly contrasting spots show up in the picture [6] because of this commotion and henceforth salt and pepper clamor. This commotion emerges in the picture as a result of sharp and sudden changes of picture flag. Tidy particles in the picture procurement source or over warmed defective segments can cause this sort of clamor. Picture is undermined to a little degree because of clamor.

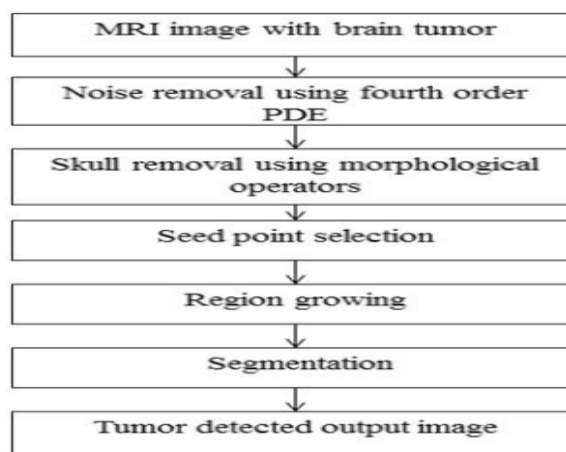
## IV. COMPARATIVE STUDY

Among various types of filters, each has different characteristics and working of each one is different for different types of images. Various filtering technique are applied on the MRI brain image which help for the comparative study among different types of filters.

Table 1: Comparative Result

Filters	Effects
KSL filtering	Noise removal in different types of MRI brain images like low SNR MRI, partially parallel MRI and so on
Median filtering	Remove the outlier without reducing the sharpness of the image. So performs better result in MRI brain for noise removal.
Wiener filter	Involves noise smoothing and inverse filtering.
Adaptive filter	Requires less computation time
Mean filter	Removing grain noise from an image

Proposed Methodology:



## V. CONCLUSION

Noise is one of obstacles in automatic image understanding and noise reducing is very important to improve the results of this process. In this paper various filtering algorithms are implemented on MRI images to remove different types of noise. X-ray pictures when caught more often than not have Gaussian clamor and salt and pepper commotion. To expel this commotion sifting calculations are presented. The outcomes are examined and assessed. Through this work we have

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watched that the decision of channel for upgrading the MRI picture relies upon the sort of the sifting strategy, which is utilized. Among different channels mean channel, anisotropic channels are less productive. Middle channel performs better outcome in MRI cerebrum picture to evacuate clamor. The outcomes accomplished through this paper are valuable for medicinal purposes to break down the picture. Moreover, the paper presents comparative study of noise reducing techniques.

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