International Journal of Research in Management, Science & Technology (E-ISSN: 2321-3264)
Vol. 5, No. 3, December 17
Available at www.ijrmst.org

REVIEW ON REMOVAL OF IMPULSE NOISE FROM IMAGES

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Abstract: Image restoration is the process of restoring the corrupted image back to its original form. It is the initial step of image processing. Noise is added in the image while sending an image from one place to another via satellites, wireless, or during image acquisition process. There are various types of noises such as salt and pepper noise(impulse noise), Gaussian noise etc. The main goal of image restoration is to recover or improve the quality of an image, identifies the type of noise and attempts to reverse it. The restoration process improves the image by using a priori knowledge of the degradation process. During image acquisition process degradation occurs.The degradation process first determine the type of noise, and then apply the inverse process to recover the corrupted image.

Keywords: DIP, Salt-and-pepper noise ,image restoration , Median filter

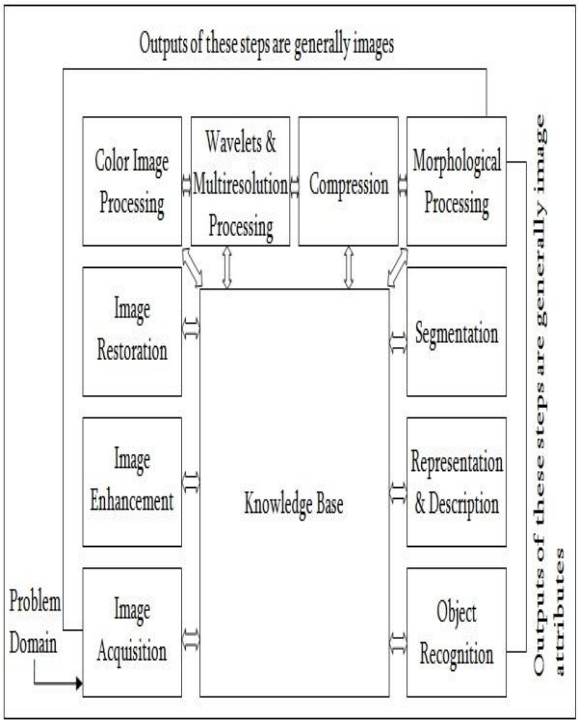
I. INTRODUCTION

Digital image processing proceed with refines of digital images through a digital computer. It is a subfield of signals and systems but concentration particularly on images. DIP concentrates on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system perform action by process that image using well organized algorithms, and gives an image as an output. The most common example is Adobe Photoshop. It is one of the mostly used application for processing digital images.

How it works :

In the above figure, an image has been captured by a camera and has been sent to a digital image processing system to remove all the other details, and just focus on the water drop by zooming it in such a way that the quality of the image remains the same. Signal processing is a direction in electrical engineering and in mathematics that allot with analysis and processing of analog and digital signals , with storing , filtering , and other effects on signals.

Fundamental Steps in Digital Image Processing :



II. LITERATURE REVIEW

Zayed M.Ramadan [1] introduces a method for ejection of salt-and-pepper noise from images. The method consists of two step: detection and filtering. In the detection step, two conditions must be satisfied for a pixel to be considered noisy. The first condition is based on complication of the corrupted image with four difficult kernels and the second depends on the pixel under consideration in the sliding window and its neighborhood. In the filtering step, the common median filtering is used except that only pixels that are considered noise-free in the sliding window of the detection step are included in the calculations of the median value that replaces the infected pixel value. Small size of sliding windows and wide range of noise thickness are used in this paper.

Sin Hoong Teoh and Haidi Ibrahim [2] As the information from digital images are easier to be evaluated as compared with one dimensional signals, digital images are now commonly used in many research fields. Unfortunately, similar to other digital signals, digital images are also sometimes unintentionally corrupted by unwanted signals, called noise. One of the noises commonly corrupting digital image is the impulse noise. Therefore, impulse noise reduction has become one of the active researches in these recent years. Many impulse noise models have been proposed by researchers for this research purpose. The research is done by a survey on available online materials. However, because there are more than thousands of related articles available online, the survey was carried out based on the keywords related to those articles. The research was restricted only to IEEExplore® database. The result from this survey shown that the research related to impulse noise model in digital image processing is still showing an increasing trend. Among the impulse noise models, the salt and- pepper noise is the most used impulse noise model incurrent literature.

Priyanka Rastogi and Neelesh Gupta [3] Noise removal is one of the biggest challenges in the field of image processing. Impulse noise removal is one of the most necessary and important preprocessing step in digital image processing. Several median based techniques are reported in literature for different noise models. Each of them has their advantages and limitations. Most of the filters are good at noise prevention but their performance decreases in terms of edge protection. various algorithms for removal of fixed valued impulse noise and their performance under different noise conditions and for various fixed valued noise models is discussed. All the techniques have their advantages and limitations. The comparative study helps in identification of most efficient algorithms in terms of edge protection and noise prevention to restore the original image to the best possible extent given the degraded version. Most of the techniques are suitable for some particular noise models and thus does not perform satisfactorily on other types of noise models.

Ravneet Kaur, Er. Navdeep Singh [4] Image restoration is the process of restoring the degraded or corrupted image back to its original form. Noise is added in the image while sending an image from one place to another via satellites, wireless, or during image acquisition process. There are various types of noises such as salt and pepper noise(impulse noise), Gaussian noise etc. The main goal of image restoration is to recover or improve the quality of an image, identifies the type of noise and attempts to reverse it. The restoration process improves the image by using a priori knowledge of the degradation process. The degradation process first identifies the type of noise, and then apply the inverse process to recover the corrupted image. In this paper various spatial domain filters are discussed which are used to remove noise from the images.

Tzu-chao lin and pao-ta yu [5] introduces a novel decision-based filter, called the multiple thresholds switching (MTS) filter, is proposed to restore images infected by salt-pepper impulse noise. The filter is based on a detection-estimation strategy. The impulse detection algorithm is used before the filtering process, and therefore only the noise-infected pixels are replaced with the estimated central noise-free ordered mean value in the current filter window. The new impulse detector, which uses multiple edges with multiple neighborhood information of the signal in the filter window, is very precise, while avoiding an undue increase in computational complexity. For impulse noise prevention without dirty fine details and edges in the image, extensive experimental results demonstrate that our scheme performs significantly better than many existing, well-accepted decision-based methods.

Tang Xianghong, Zheng Yan and Yang Quanwei [6] introduce the algorithms of salt and pepper noise which have many problems, such as long time complication, skip of the image edge and drawbacks of the details management. In order to get free of these problems, this paper presents an algorithm of denoising salt and pepper noise based on edge classification. The algorithm first applies mesh division to noise reduction algorithms of salt and

pepper noise. The edge mesh and non- edge mesh are processed by different methods. Experimental results showed the proposed algorithm could obtain higher Peak Signal-to- Noise-Ratio value and protect the edges of images. The research in this paper would have great significance to improve the quality of image.

Madhu S. Nair, K. Revathy, and Rao Tatavarti [7] An improved decision-based algorithm for the restoration of gray-scale and color images that are highly infected by Salt-and-Pepper noise, is proposed in this paper which efficiently removes the salt and pepper noise while maintaining the details. The algorithm utilizes previously processed neighboring pixel values to get better image quality than the one utilizing only the just previously processed pixel value. The presented algorithm is faster and also produces better result than a Standard Median Filter (SMF), Adaptive Median Filters (AMF), Cascade and Recursive non-linear filters. The advantage of the proposed algorithm (PA) lies in removing only the noisy pixel either by the median value or by the mean of the previously processed neighboring pixel values.

Sukhwinder Singh , Dr. Neelam Rup Prakash [8] proposed an image denoising filter for salt & pepper noise . They introduced a ROAD (Rank Order Absolute Difference) statistics in this filter to locate the noisy pixels in image infected with salt & pepper noise. ROAD statistics values quantify how different in intensity the particular pixels are from their most similar neighbours. After located the presence of impulse noise, adaptive window filtering concept is used to filter the salt & pepper noise. At the end, to check the filtering performance of the proposed filter; various tests were conducted by taking various salt & pepper noise corrupted gray scale images as test images.

Abhishek R , Srinivas N [9] The filtering mainly used for removal of impulse noise for noise free images and fully recovered by minimum signal distortion also uninfected the images. For best solutions of ejection of salt and pepper noise is a nonlinear digital filters which is based on order statistics of median filter. The Median filters are eliminate destroyed signal and unwanted signals without affecting the corners. Median filter are operates in low densities but not in higher densities because at higher the image are blurred and damage the image. The filtering leaves the uninfected pixels and accepts the infected pixel. Median filter is applied to image unconditionally for alert the strength of eliminate the noisy signal from image then the results between the infected and uninfected pixels are earlier to applying nonlinear filtering is highly sensible in images. The process of "Adaptive Median "filter is to locates the noisy images or pixels and then remove the noisy pixels and replace them at same position by using the median filters , where the remaining are same or unchanged. The Adaptive median filter is best for removal of noisy pixels at low level. But at high level noise the adaptive median filter is provide a large Window size it is not to fit the pixel. The Adaptive median filter is also called as "switching" and "decision based" system.

E.Jebamalar Leavline, D.Asir Antony Gnana Singh [10] gives an experimental analysis of median based impulse noise removal for gray scale images. Median filters are offered for removing impulse noise because of their simplicity and less computational complexity. In experimental results show that, among the methods compared, tristate median filter and switching median filter show attractive results. The other methods such as standard median filter, adaptive median filter, weighted median filter lack in protecting edges while maintaining some noise components. However, these methods are fit for impulse noise removal allowed the noise density is low. If the noise density is too high, say >90%, then the methods like trimmed median filter may yield better noise reduction performance.

Faruk Ahmed and Swagatam Das [11] Proposed a novel adaptive repetitive fuzzy filter for denoising images infected by desire noise. It operates in two stage—discovery of noisy pixels with an adaptive fuzzy detector follow by noise reduction using a subjective mean filter on the “good” pixelsin the filter glass. The filter is also shown to be vigorous to very high levels of noise, retrieve significant detail at noise levels as elevated as 97% .

Sakshi Tiwari, Prof. Akhilesh Bansiya, Prof. Raj Kumar Paul [12] Noise is an important factor which when get added to an image reduces its quality and appearance**.** So in order to enhance the image qualities, it has to be removed with protecting the textural information and structural features of image. There are different types of noises exist who corrupt the images. Noise removal from a corrupted image signal is a important field of research and many researchers have suggested a large number of algorithms and compared their results. The main thrust on all such algorithms is to remove impulsive noise while keeping image details. These schemes differ in their basic methodologies applied to

suppress noise. A comparative study of all these algorithms in context of performance evaluation is done and concluded with several promising directions for future research work.

Chandra Sekhar Panda, Srikanta Patnaik [13] In this, different novel low pass filtering schemes are investigated to restore a gray scale image infected by Salt & Pepper noise. The filtering methods with different window sizes are applied to corrupted images with varying strengths and different noise probability. They have proposed both subjective and objective methods to evaluate the performance of different filtering techniques for noise removal with an aim to find an efficient filter which will be suitable for real time image restoration applications. Subjective methods have been performed by visually comparing the different restoration characteristics in the output image. The mean square error, signal to noise ratio, peak signal to noise ratio and signal to noise ratio improvement have been used for objective evaluation of the different filtering schemes.

Chih-Yu Hsu , Ta-Shan Tsuib, Shyr-Shen Yub, and Kuo-Kun Tseng [14] introduce software programming for evolving an algorithm and software for reduction of salt and pepper noise by cellular automata. These algorithm and software called cellular automata denoising (CAID) toolkit and examine how the CAID toolkit is designed. Matlab code was used to develop a software program removing salt and pepper noise in gray and color images.

Kanhaiya & Mr. Paruraj [15] Image restoration is the process to restore infected images which cannot be taken again or the process of obtaining the image again is costlier. We can restore the images by earlier knowledge of the noise. Image restoration is done in two domains: spatial domain and frequency domain. In spatial domain the filtering action for restoring the images is done by directly operating on the pixels of the digital image. In frequency domain the filtering action is done by mapping the spatial domain into the frequency domain by taking fourier transform of the image function. By mapping the image into frequency domain an image can provide awareness for filtering operations. After the filtering, the image is remapped into spatial domain by inverse fourier transform to make the restored image. Different noise models were studied. Different filtering techniques in both spatial and frequency domains, were studied and improved algorithms were written and simulated using matlab. Restoration efficiency was checked by taking peak signal to noise ratio (psnr) and mean square error (mse) into considerations.

III. CONCLUSION

The review of different research paper has given the various technique for removing salt and paper noise from digital images. . In order to restore noisy images there are many image restoration and filtering techniques available that can recover the original image from the degraded image. As there are number of technique used but still there is a some to happen. Further study can be done in this field to provide more effective methodologies.

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