A LITERATURE SURVEY ON IMAGE DENOISING & COMPRESSION

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Abstract: This paper addresses the problem of image denoising which is still a valid. An image is often corrupted by noise in its acquisition and transmission. In order to improve the quality and visual perception of an image, image must be noise free and the important features like edge details should be retained as much as possible. Due to the increasing traffic caused by multimedia information and digitized form of representation of images; image compression has become a necessity. In this paper we studied and analyzed different image denoising & compression methods. During survey of work we have found that different authors have developed and proposed separate methods to solve the purpose. Among them we have concluded that there is not any unique method in this regard and another method may also be proposed. Performance of de-noising algorithm & compression is measured using quantitative performance measures such as Peak Signal-to-Noise Ratio (PSNR) and Mean Square Error (MSE). So, in this paper, we come across to develop a novel and effective algorithm for removing impulse noise.

Key Words: Patch based ordering, PSNR, MSE, impulsive noise.

1. INTRODUCTION:

Image denoising is very important on guaranteeing the effectiveness and robustness of other image processing algorithms in the industry image process procedures, such as image registration, image segmentation [3]. The removing of noise from any affected image is referred as denoising. The goal of denoising is to remove the noise and to retain the important image features as much as possible. There are many filters that are used as an initial action before post-processing (i.e. image segmentation) by taking neighboring pixels into consideration which extremely 'noisy' pixels that could be filtered out. Recently many challenges have been made to reduce the noise from images using wavelet transform as a multi-resolution image processing tool [5].

Uncompressed multimedia (Image, audio, signal) data requires considerable storage capacity and transmission bandwidth despite rapid progress in mass storage density, processor speeds and digital communication system performance, demand for data storage capacity and data transmission bandwidth continues to outstrip the capabilities of available technologies. The recent growth of data intensive multimedia-based web applications have not only the need for more efficient ways to encode signals and images but have made compression of such signals central to storage and communication technology. At the present state technology, the only solution is to compress multimedia data before its storage and transmission, and decompress it at the receiver for playback . The basic rule of compression is to reduce the numbers of bits needed to represent an image.

In the past few years, several researches are performed in the image denoising by a huge number of researchers. In this paper, we present a comprehensive review of extremely important researches on image denoising together with compression. The popular literature existing in the image denoising & compression is categorized and reviewed comprehensively.

2. LITERATURE REVIEW:

Idan ram et.al [1] has proposed: "Image Processing using Smooth Ordering of its Patches". In this paper authors extracts all the patches with overlaps and order them in such a way that they are chained in the shortest possible path. The obtained ordering is applied to the corrupted image implies a permutation of the image pixels. This method enables us toobtain good recovery of clean image by applying relatively simple one dimensional smoothening operators(such as filtering or interpolation) to the recorded set of pixels.

Suhaila Sari et.al [2] has proposed: "Development of Denoising Method for Digital Image in Low-Light Condition". In this paper authors develops a denoising method through hybridization of bilateral filters and wavelet thresholding for digital images. The major drawback of this approach was that it is not suitable to remove impulsive noise.

Lingli Huang et.al [3] has proposed: "Improved Non-Local Means Algorithm For Image Denoising". Image denoising technology is one of the forelands in the field of computer graphic and computer Vision. Non-local means method is one of the great performing methods which arouse tremendous research. In this paper, author's proposed an improved weighted non-local means algorithm for image denoising. The non-local means denoising method replaces each pixel by the weighted average of pixels with the surrounding neighborhoods. The proposed method evaluates on testing images with various levels noise. Experimental results show that the algorithm improves the denoising performance.

Haijuan Hu et.al [4] has proposed "Removing Mixture of Gaussian and Impulse Noise By Patch-Based Weighted Means". Authors firstly establish a law of large numbers and a convergence theorem in distribution to show the rate of convergence of the non-local means filter for removing Gaussian noise. After that introduce the notion of degree of similarity to measure the role of similarity for the non-local means filter. Based on the convergence theorems, authors propose a patch-based weighted means filter for removing impulse noise and its mixture with Gaussian noise by combining the essential idea of the trilateral filter and that of the non-local means filter. Experiments results show that author's proposed filter is competitive compared to recently proposed methods.

A. Jaiswal et.al. [5] has proposed "Image Denoising and Quality Measurements By Using Filtering And Wavelet Based Techniques". In this paper authors have worked with denoising of salt–pepper and Gaussian noise. The work is organized in four steps as follows: (1) image is denoised by filtering method, (2) image is denoised by wavelet based techniques using thresholding, (3) hard thresholding and filtering method applied simultaneously on noisy image, (4) results of PSNR (peak signal to noise ratio) and MSE (mean square error) are calculated by comparing all cases.

Hossein Talebi [6] has presented *:* Authors addressed these shortcomings by developing a paradigm for truly global filtering where each pixel is estimated from all pixels in the image. Author's objectives in this paper are two-fold. First, to give a statistical analysis of their proposed global filter, based on a spectral decomposition of its corresponding operator, and study the effect of truncation of this spectral decomposition. Second,to derive an approximation to the spectral components using the Nyström extension. Using these, authors demonstrate that this global filter can be implemented efficiently by sampling a fairly small percentage of the pixels in the image.

Chandrika Saxena et.al [7] has presented: "Noises and Image Denoising Techniques: A Brief Survey". In this paper author reviews the existing denoising algorithms, such as filtering approach, wavelet based approach, and multifractal approach, and performs their comparative study. Different noise models including additive and multiplicative types are used. They include Gaussian noise, salt and pepper noise, speckle noise and Brownian noise. Selection of the denoising algorithm is application dependent. The filtering approach has been proved to be the best when the image is corrupted with salt and pepper noise. The wavelet based approach finds applications in denoising images corrupted with Gaussian noise.

Michael Elad et.al [8] has presented : "Image Denoising via Sparse and Redundant Representations Over Learned Dictionaries". Authors address the image denoising problem, where zero-mean white and homogeneous Gaussian additive noise is to be removed from a given image. The approach is based on sparse and redundant representations over trained dictionaries. Using the K-SVD algorithm, we obtain a dictionary that describes the image content effectively. Two training options are considered: using the corrupted image itself, or training on a corpus of high-quality image database. Since the K-SVD is limited in handling small image patches, we extend its deployment to arbitrary image sizes by defining a global image prior that forces sparsity over patches in every location in the image.

Florian Luisier et.al [9] has presented: "Image Denoising in Mixed Poisson–Gaussian Noise" .Authors proposed a general methodology (PURE-LET) to design and optimize a wide class of transform-domain thresholding algorithms for denoising images corrupted by mixed Poisson–Gaussian noise. Authors express the denoising process as a linear expansion of thresholds (LET) that optimize by relying on a purely data-adaptive unbiased estimate of the mean-squared error (MSE), derived in a non-Bayesian framework (PURE: Poisson–Gaussian unbiased risk estimate). Authors then proposed a pointwise estimator for undecimated filterbank transforms, which consists of subband-adaptive thresholding functions with signal-dependent thresholds that are globally optimized in the image domain.

Gabriela Ghimpe¸teanu et.al [10] has presented: "A Decomposition Framework for Image Denoising Algorithms" The model computes the components of the image to be processed in a moving frame that encodes its local geometry (directions of gradients and level lines). Then, the strategy we develop is to denoise the components of the image in the moving frame in order to preserve its local geometry, which would have been more affected if processing the image directly. Experiments on a whole image database tested with several denoising methods show that this framework can provide better results than denoising the image directly, both in terms of Peak signal-to-noise ratio and Structural similarity index metrics.

Madison Gray McGaffin et.al [11] has presented: "Edge-Preserving Image Denoising via Group Coordinate Descent on the GPU" New image processing algorithms must exploit the power offered by massively parallel architectures like graphics processing units (GPUs). This paper describes a family of image denoising algorithms well-suited to the GPU. The algorithms iteratively perform a set of independent, parallel 1D pixel-update subproblems. To match GPU memory limitations, they perform these pixel updates in-place and only store the noisy data, denoised image, and problem parameters. The algorithms can handle a wide range of edge-preserving roughness penalties, including differentiable convex penalties and anisotropic total variation. Both algorithms use the memorize–minimize framework to solve the 1D pixel update subproblem. Results from a large 2D image denoising problem and a 3D medical imaging denoising problem demonstrate that the proposed algorithms converge rapidly in terms of both iteration and run-time.

3. PROBLEM FORMULATION:

After studying different approaches we observe that some of the approach provides good denoising for image, but still there is need of an approach which may provide better agreement of result.

4. PROPOSED WORK:

After analyzing several techniques we proposed an approach to denoise image with compression. Combined decision based adaptive median filter with patch based smoothening operator is applied on impulsive noisy image. With the help patch based smoothening operator unpleased artifacts are smoothen and betterment of result is expected. After the process of denosing ,image compression is applied for better storage and transmission.

5. CONCLUSION:

In this paper we present a survey on image denoising. Concentrating on different denoising techniques and emphasize on the problems, we also suggest an efficient solution to solve the above problem.

A large number of linear and non linear filtering algorithms have been developed to reduce noise from corrupted images to enhance visual quality. The most common type of noise is the salt & pepper noise. Linear filtering is efficient technique to deal with additive noise while non-linear filters are efficient to deal with the multiplicative and function based noise. A novel and effective algorithm for removing impulsive noise is proposed. If we are moving to the wavelet transform domain method then non adaptive basis function based wavelet transform domain method provides better de-noising while preserving the details of image like edges. PSNR and MSE are the performance parameters.

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