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AN IMPROVED IMAGE QUALITY ENHANCEMENT AND ANTI-FORENSICS BASED ON EDGE PRESERVING FILTER

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ABSTRACT

The edge preserving filter is one type of filter used in image denoising process. It soothes three edges of the pixels. It is also used by anti-forensic researchers in helping disguise traces of other image processing operations. In existing system median filtering technique is used. The median filter is relatively expensive and complex to compute. In this paper, it proposes a new scheme for image quality enhancement by anti-forensic with edge preserving filter. In this method there are two processes 1. Image denoising by edge preserving filter 2. Quality improvement. This algorithm cleans up the image noise in the homogenous area, but preserves all image structures like edges or corners.Here we take a noise as random noise are added to an input image. That noisy image may denoised by EPF and also that filtered image has low quality that can be improved by CLAHE or global histogram equalization.

***Keywords*:, *edge preserving filter, filtering, fingerprints, global histogram equalization, Image processing peak-signal-to-noise ratio (PSNR*).**

I. INTRODUCTION

Image processing is a technique of processing images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photographs or videos. The output of image processing may be either an image or a set of characteristics or parameters related to the image. Image processing usually refers to digital image processing, but different images such as optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The process of acquiring images as the input for processing is called as imaging.

The first step in image processing is digital image acquisition using sensors such as optical or thermal wavelength. The captured two dimensional signals are sampled and quantixied to yield digital images. At times, we may receive noisy images that are degraded by certain mechanism. The most common source of this image degradation is due to optical lens system in digital camera that acquires the visual information. If the camera is not focused properly, it may in an blurred image. This blurred image is due to the defocused camera. At times,

there will be relative motion between the object and the camera. So, we need appropriate techniques of refining the images so that the output image are better visual quality,free from aberrations and noises.

Image enhancement, filtering and restorations finds important work in image processing. Noise, which is always present in every real world image, hampers manual interpretation by human experts as well as automatic analysis by computers. The wiener filter is a linear filter that requires a prior knowledge of the spectrum of the noise-free image as well as spectrum of noise. In an oriented texture domain or along individual lines and edges, the noise level can be reduced by applying elongated smoothing operators that adapt to the local orientation. This requires a robust and continuous representation of orientation.since many natural images can be described as a collection of grey value and oriented texturedomains, a scale and orientation adaptive smoothing scheme provides a powerful noice reduction method.such a scheme is realized by anisotropic diffusion [1]. The anisotropy can be measured from the ratio of the energy in the dominant and perpendicular orientation.

Where a1,a2 the eigenvalues of the GST. Value will be between o and 1i.e will be isotropic or completely anisotropic [1].

Bilateral filtering is a technique to smooth images while preserving edges. The advantages are formulation is simple and it depends only on two parameters that indicate the size and contrast of the features to preserve. We present a new technique for the display of high-dynamic-range images, which reduces the contrast while preserving detail. It is based on a two-scale decomposition of the image into a base layer, encoding large-scale variations, and a detail layer. Only the base layer has its contrast reduced, thereby preserving detail. The base layer is obtained using an edge-preserving filter called the *bilateral filter*. This is a non-linear filter, where the weight of each pixel is computed using a Gaussian in the spatial domain multiplied by an influence function in the intensity domain that decreases the weight of pixels with large intensity differences. We express bilateral filtering in the framework of robust statistics and show how it relates to anisotropic diffusion. We then accelerate bilateral filtering by using a piecewise-linear approximation in the intensity domain and appropriate sub sampling. This results in a speed-up of two orders of magnitude. The method is fast and it does not require any parameter setting.[2].

The bilateral filter is also defined as a weighted average of nearby pixels, in a manner very similar to Gaussian convolution. The difference is that the bilateral filter takes into account the difference in value with the neighbors to preserve edges while smoothing. The key idea of the bilateral filter is that for a pixel to influence another pixel, it should not only occupy a nearby location but also have a similar value [3].

Thus, a number of filters are used for filtering the images. Here, the proposed system implements bilinear edge preserving filter to enhance the quality of an images.

The rest of the paper is organized as follows. Section 2 described proposed system and section 3 presents the proposed method. The implementation of the system is discussed in section 4 and section 5 together with the discussion of various results obtained from testing the system based on the proposed algorithm with various sizes of data. The image is also tested using the PSNR value. Finally, we conclude the paper in section 6.

II. LITERATURE SURVEY

Matthias Kirchner,Jessica Fridrich

In this paper, a simple yet effective technique to detect median filtering in digital images—a widely used denoising and smoothing operator. As a great variety of forensic methods relies on some kind of a linearity assumption, a detection of non-linear median filtering is of particular interest.

Chen and J. Ni [2011]

In this paper,Observation that, compared with original and linear filtered images, median filtered images exhibit distinct intrinsic traces around edges, e.g. neighborhood correlation, noise suppression and good edge preservation. Such MF intrinsic fingerprints are characterized as the Edge Based Prediction Matrix (EBPM), which contains the estimated prediction coefficients of neighborhood prediction among different edge regions in images. By incorporating the support vector machine (SVM), the MF detector is developed based on EBPM.

Wei Fan, Kai Wang, François Cayre& Zhang Xiong

In this paper proposes an image variational deconvolution framework for both quality enhancement and anti-forensics of median filtered (MF) images. Our method can serve as an MF image quality enhancement technique, whose efficacy is validated by experiments conducted on MF images which have been previously "salt & pepper" noised. Using another parameter setting and with an additional pixel value perturbation procedure, the proposed method outperforms the state-of-the-art median filtering anti-forensics, with a better forensic undetectability against existing detectors as well as a higher visual quality of the processed image.

III. PROPOSED SYSTEM

The proposed system consists of three techniques and inorder to remove the Gaussian, salt and pepper noise from an given input image. Dct/idct is one of the technique used to compress the given image and displays in 8x8 or 16x16 blocks. Then random noise is added to get an noisy image. It is filtered through edge preserving filter which smoothes the edges and prevents the loss of information present at the edges. Finally, global histogram equalization technique is implemented. This involves increasing the global contrast of many images, especially when the usable data of the images is represented by close contrast values. Hence, the quality can be enhanced.

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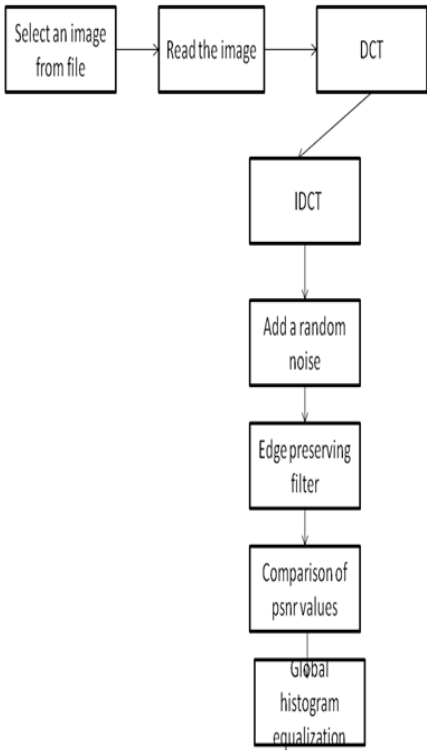

Figure 1. system architechture

The figure 1 shows the steps to remove noise and enhance the quality of an biometric image. The input is obtained and compressed using dct compression then noisy image is filtered using edge preserving filter. The psnr values for each image is calculated and comparison is made. Finally image is enhanced using global histogram equalization.

A. DCT/IDCT compression

A **discrete cosine transform** (**DCT**) expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. DCTs are important to numerous applications in science and engineering, from losscompression of audio and images (e.g. JPEG) where small high-frequency components can be discarded, to spectral methods for the numerical solution of partial differential equations. The use of cosine rather than sine functions is critical for compression, since it turns out (as described below) that fewer cosine functions are needed to approximate a typical signal, whereas for differential equations the cosines express a particular choice of boundary conditions**.**

In the JPEG image compression algorithm, the input image is divided into 8-by-8 or 16-by-16 blocks, and the two-dimensional DCT is computed for each block. The DCT coefficients are then quantized, coded, and transmitted. The JPEG receiver (or JPEG file reader) decodes the quantized DCT coefficients, computes the inverse two-dimensional DCT of each block, and then puts the blocks back together into a single image. For typical images, many of the DCT coefficients have values close to zero; these coefficients can be discarded without seriously affecting the quality of the reconstructed image.It computes the two-dimensional DCT of 8-by-8 blocks in the input image, discards (sets to zero) all but 10 of the 64 DCT coefficients in each block, and then reconstructs the image using the two-dimensional inverse DCT of each block. The transform matrix computation method is used.

B. JPEG (joint picture expert group)

Discrete cosine transformation is very famous image processing techniques which is best suited for JPEG images. JPEG images are widely used over the internet and have lossy nature of compression. DCT is extensively used for image and video compression. Every block of DCT is quantized with the help of quantization table of JPEG. For the execution of image compression in the coordination of JPEG, initial step is to convert the RGB color coordination into the coordination of YUV. In this coordination the Y component refers to matching the brightness of a pixel and the U and V components refer to the color of a pixel [8]. Currie, D.L. & Irvine, C.E. Illustrate that the human eye is very sensitive to changes in brightness of pixels more than the changes in color of pixels [9].Some samples are taken from the bottom of color data to reduce the file size when applying JPEG compression. The use of a factor 2 will reduce the size of the file, where the color components (U and V) are reduce by half in the horizontal and vertical directions [8].

Final stage is the quantization of the compression. One form biological characteristics of the human eye can be exploited: that the human eye is rather good to distinguish between differences in brightness or (luminance) in low frequencies, but they are not good at distinguishing between differences in lighting or brightness in the high frequencies. This identify that the strength of high frequency shrunk, without any effect on the appearance of the image. To further reduce the file size, the result is rounded to the integer values and the coefficients are encoded by using Huffman coding [8].

C. Edge preserving filter

A huge number of filters for single band images has been proposed in the long history of image processing. As color images became affordable with respect to sensors, memory and processor speed, some of these filters have been extended to color. If a linear filter, such as a Gaussian or mean filter, is applied to each channel of an RGB image separately, the resulting image will contain usually color triplets which are not present in the input image. Such artifacts yield perceptional differences which can be avoided by non-linear filtering. On the other hand, additive noise, such as additive Gaussian noise, can be removed by a low-pass filter which averages color vectors[9].

Filters which are quoted to smooth homogeneous areas while preserving edges are the – EPS (Edge preserving smoothing), presented for gray-level images are called as Non-Linear Filters[9].

D. Random noise

Noise is the undesirable effects produced in the image. During image acquisition or transmission, several factors are responsible for introducing noise in the image. Depending on the type of disturbance, the noise can affect the image to different extent. Generally our focus is to remove certain kind of noise. So we identify certain kind of noise . Image noise can be classified as Impulse noise (Salt-and-pepper noise), Amplifier noise (Gaussian noise), Shot noise, Quantization noise (uniform noise), Film grain, on-isotropic noise, random noise, Multiplicative noise (Speckle noise) and Periodic noise. Here, we select random noise as input.

E. Comparison of psnr values

Peak signal-to-noise ratio, often abbreviated PSNR, is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of

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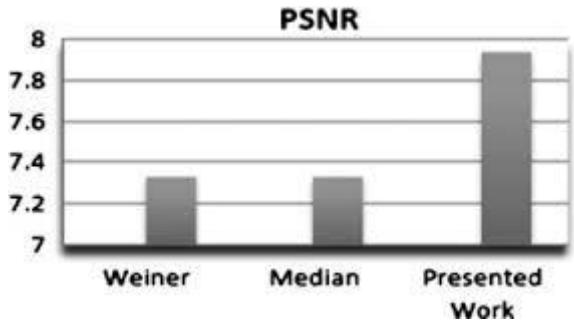
the logarithmic decibel scale. As a performance measurement for image distortion, the well-known peak-signal-to-noise ratio (PSNR) which is classified under the difference distortion metrics is applied to the stegoimages. It is defined as Eq (2):

PSNR= 10log(c2 max/MSE) (2)

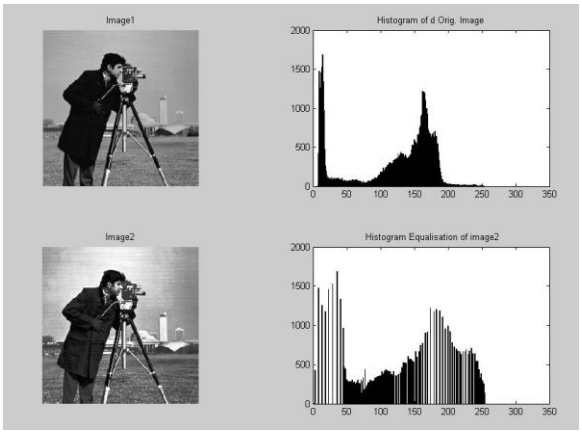
Where MSE denotes mean square error which is given as Eq (3):

MSE=1/MN $\sum_{x=1}^{M} \sum_{y=1}^{M} (sxy - (xy)2$ (3)



F. Global histogram equalization

This method usually increases the global contrast of many images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.



System implementation

The system ouput is the simulation based studies.It is evaluated using Matlab tool. Based on the bilateral edge preserving filter accuracy and reliability of an biometric image can be obtained. Quality enhancement and noise filtering is implemented.

Table1.Capacity and PSNR for images

Image type	*PSNR value*	*MSE value*
Original image	63.9334	0.0263
Median filtered image	65.25761	0.0493

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Output image	61.2032	0.0194

IV. CONCLUSION

The experiments were implemented on a given set of images. The noises added and the noisy image can be filtered and the obtained image will be perfectly filtered and data present on the edges will also be preserved. Lack of quality in filtered image can be improved by global histogram equalization technique.

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