Watermarking in Chemical Images using Alpha Blending

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***Abstract*— The development of computer networks creates many benefits in the digital imaging area which is applicable in chemical imaging too. But this easy access provides virtually unprecedented opportunities to pirate copyrighted chemical images. Maintaining privacy and authenticity in chemical information is an essential requirement but unfortunately, it is not possible to do this. Digital watermarking is a technique that is very often used in chemical image processing to trace copyrighted chemical images. It can also be used to trace chemical images that are illegally distributed without permission. A digital watermark is a pattern of bits inserted into digital media that can identify the authorized users. In our research work, a new technique of visible and invisible Digital watermarking of chemical images using alpha blending has been proposed. We have worked on color chemical images which is digital watermarked with different values of alpha blending. For color imaging, this digital watermarking is actually done on each plane of the chemical image. The resulting chemical image contains the digital watermark information. Using the proper value of alpha, the original chemical image can be retrieved from the digital watermarked image. Applying for some post-processing work, this can be used in chemical image steganography also Though there are many available processes are there for watermarking, but due to vary fast processing, alpha blending process is advantageous compared to others. PSNR values and correlation coefficients are calculated to measure the quality of the output images.**

Keywords: Chemical image, alpha blending, digitalwatermarking, PSNR, image security

1. INTRODUCTION

Digital watermarking is employed for info security as copyright protection, information authentication, broadcast observation, and covert communication. The watermark is embedded into a bunch image in such the simplest way that the embedding-induced distortion is just too little to be noticed. At constant time. the embedded watermark should be strong enough to resist common degradation or deliberate attacks. in addition, for given distortions and hardiness levels, interested one would really like to introduce the maximum amount as doable in an exceedingly given host image. Watermarking will be wiped out the abstraction domain likewise as optical frequency domain. abstraction domain watermarking is that the modifying of constituent values directly on the abstraction domain of the image. abstraction domain watermark is easy and don't want the initial image to extract the watermark. They conjointly offer a far better compromise among hardiness, capacity, and physical property.

However, they need the disadvantage of not being strong against image process operations as a result of the embedded watermark isn't distributed round the entire image and also the operations will so simply destroy the watermark. we've worked within the abstraction domain. In chemical image process, there's a good application of digital watermarking. There are two differing types of digital watermarking. associate degree invisible digital watermark is associate degree embedded image that commonly cannot be derived with human eyes. It will be extracted employing a special technique to spot the copyright owner. In general, invisible digital watermarking will be wiped out either the abstraction domain or frequency domain. Whereas visible digital watermarking will be derived simply. There are several techniques used for satellite image digital watermarking in each domain. Some explicit designated techniques that are used for steganography will be used for invisible digital watermarking too. A Patra et. al planned a way of digital watermarking exploitation alpha mixing for invisible digital watermarking too. A Patra et. al planned a way of digital watermarking exploitation alpha mixing They have specially used their technique invisible digital watermarking. [1] David Ramirez et al launched a theme for invisible color digital watermarking technique in anaglyph 3D pictures. they need inserted the image within the DCT domain exploitation the QIM-DM methodology. [2]P Sharma and S Hindu used a three-level distinct rippling remodel for digital watermarking. In their methodology, they need used a way wherever a multi-bit digital watermark is embedded into the low-frequency subband of a canopy image by exploitation the Alpha mixing technique. throughout embedding, a digital watermark image is distributed inside the initial image relying upon the scaling issue of the alpha mixing technique. [3] X Luo et al. planned a theme exploitation Edge adjustive for image steganography and invisible digital watermarking. during this technique, the sting adjustive theme selects embedding regions in line with the scale of the key image and also the distinction between 2 consecutive pixels of the quilt image. [4] Yan et al. planned a digital watermarking

approach to shield vector geo-spatial information from nonlegal use. [5] subgenus Chen et al. planned a digital watermarking technique supported the frequency domain. They planned to boost the defect of the JPEG quantification so as to cut back the bit error rate of the retrieved digital watermark. additionally, two parameters referred to as dominant factors are wont to regulate the worth of the DCT constant so as to trade-off the qualities between the digital watermarked pictures and retrieve the digital watermark. [6] L Rajab et. al. launched a theme applying two-level DWT to the video scene followed by Schur decomposition within which the binary digital watermark bits are embedded within the resultant block higher triangular matrix. In their theme, the physical property of the theme is extremely high thanks to the utilization of distinct rippling transform; thus, no visual distortion is noticed within the digital watermarked video when embedding. [7] G Kaur et al have mentioned the smallest amount important bit (LSB) for image digital watermarking in their technique. they need applied this method within the abstraction domain solely. Their technique is easy however isn't applicable within the frequency domain. [8]. A Patra et al used alpha mixing in medical pictures.[9]

In this paper, we've used one color chemical image, and one grayscale traditional image. The grayscale traditional image is employed as a digital watermark image. At first, the selected color chemical image is divided into 3 planes, Red Green and Blue respectively. In the next process, we have applied alpha blending process to any one of three planes of selected chemical image as well as grayscale image. During the reconstruction process, we have added together the alpha blended plane of the selected image and the grayscale plane (which is also alpha blended) to form a single image. Then we have varied the value of alpha and applied the above-mentioned process again and again. Entire process is described in methodology part.

II. METHODOLOGY

In the methodology part, we have explained the entire process.

i) Selection of alpha value (it should be between 0 to 1)

ii) Division of selected image into three planes

iii) Application of down sampling in each frame

iv) Transmission of down sampled frames

v) Reconstruction of down sampled frames by up sampling

vi) Addition of up sampled frames to reconstruct video

vii) Calculation of PSNR, correlation coefficient

Let us assume that selected chemical images are $s2(x,y)$ where $g(x,y)$is the color image and $h(x,y)$ is the normal gray scale image which is used as cover image. Here three planes of main image $g(x,y)$ is represented by $g_r(x,y)$, $g_g(x,y)$ and $g_b(x,y)$ respectively. Initially, we have transformed the main color image into grayscale image.

During gray scale conversion, we have converted the main image $g(x,y)$ into grayscale form $g1(x,y)$. In the next step, this image is multiplied by α. Selected grayscale image $h(x,y)$ is multiplied by (1 – α). The two outputs are added together to form the blended image.

Mathematically, we can write,

$$s1(x,y) = g1(x,y) * \alpha \quad (1)$$

$$s2(x,y) = h(x,y) * (1-\alpha) \quad (2)$$

Blended Image,

$$s(x,y) = s1(x,y) + s2(x,y) \quad (3)$$

During color image watermarking, at first, we have multiplied each pixel of red plane $a_r(x, y)$ of the color image a (x, y) by different values of alpha (α). The resultant image is represented by c1 (x, y). Similarly, each pixel of the second image h(x, y) is multiplied by alpha (1- α). The resultant image is represented by c2 (x, y). The sum total two multiplied images formed the blended image. It is represented by e(x,y). Same process is done with each pixel of green plane and blue plane.

Mathematically we can write as,

for red plane

$$c1(x,y) = ar(x,y) * \alpha \quad (4)$$

By adding equation (4) and (2) , we get

$$c2(x,y) = c1(x,y) + s2(x,y) \quad (5)$$

Same is applicable in green as well as blue plane also.

III. RESULT

We have worked in MATLAB 2015 software, i5 processor, 16 GB RAM to perform this simulation operation.

The selected images are shown in Fig 1(a) and 1(b). Fig1(a) represents the color image $g(x,y)$ and Fig 1(b) represents grayscale image $h(x,y)$.

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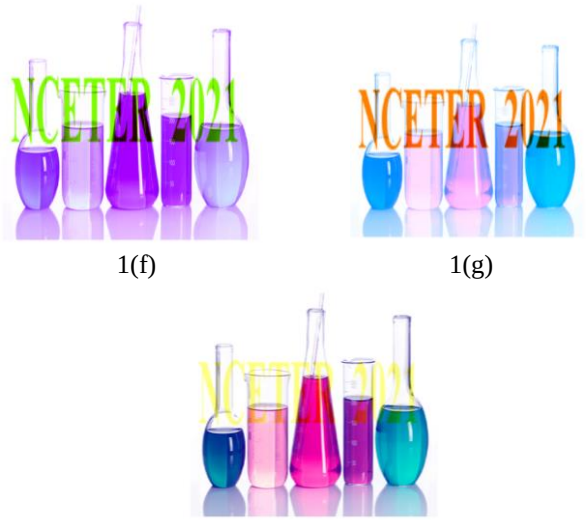
1(a) 1(b)

1(c) 1(d)

1(e)



1(f) 1(g)

1(h)

Figure 1(a-h) – Different Output

Figure 1(c) is the grayscale image of main image $g(x,y)$. figure 1(d) and figure 1(e) display the blended image output. Here value of α is selected as 0.3 and 0.5 respectively.

Figure 1(f), 1(g) and 1(h) illustrating the blended image when blending is applied at red, green and blue planes respectively. Selected value of α in each case is 0.3.

PSNR and Correlation Coefficient calculation:

PSNR is calculated to measure the quality of the reconstructed images. Correlation coefficient is used to measure the similarity between two images. If it is close to 1, then it is decided that reconstructed image quality is very good. Both values are displayed in the table.

TABLE

Frame no	PSNR	Correlation Coefficient
1	28.4	0.862
2	29.1	0.845
3	28.6	0.81
4	27.9	0.78
5	28.3	0.788
6	29.2	0.712
7	28.8	0.754
8	29.1	0.722

COMPARED WITH PREVIOUS METHODS (ADVANTAGES OF THIS METHOD)

In many proposals in the literature review part, what we have discussed in the introduction part,, there are many drawbacks :
They are

1. Time consuming
2. Applicable for low resolution images only
3. Noise effected

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Compared with previous methods, advantages of our method are

1. Very fast. This is the main advantage of our method. In simulation testing, we have observed that it takes 0.2 sec only for the entire process.
2. Applicable for high resolution images
3. PSNR value is reasonably good.

CONCLUSION

The above-mentioned technique can be used to maintain the privacy and authenticity of chemical images. From the above result, it is clear that by using this simple process we can digitally watermark any color chemical image by performing an alpha blending operation with one of its planes simplified manner. In our experiment, we have selected values of alpha 0.01 and 0.3. By varying the value of it, we can highlight the main chemical image (color image) from the cover image. However, from the images, it has been observed that blending

with the green plane of the color chemical image is suitable for visible digital watermarking whereas blending with the blue plane of the color image is suitable for invisible digital watermarking. In the case of all planes, visible digital watermarking is possible for higher values of alpha but in the case of the blue plane, digital watermarking is not clear even in a higher value of alpha. It is very clear that using a low value of alpha, we can create invisible digital watermarked chemical images. This technique can be used for Image Steganography purposes after some post-processing work which will be discussed in future communication.

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