Volume 6, Issue 5, May 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Improved PSNR and NC in Digital Image Watermarking Using RDWT and SVD

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Abstract: This paper presents a literature survey on Digital Watermarking within an image. It describes the early work carried out on digital watermarks, including the brief analysis of various watermarking schemes and its applications. This paper also makes a comparison between various watermarking schemes .This paper also gives us a brief introduction about the procedure of digital watermarking.

Keywords: Digital Watermarking, DCT, DWT, DFT, LSB, Watermarked Image

I. INTRODUCTION

In last years, due to the growth of technology, the distribution of multimedia data in digital form by internet became very popular. Such open access to multimedia data allows the internet users to change this data in a number of ways. This can be done by large scale duplication, changing or stealing the original data from the internet. Thus it has become difficult for the copyright owner to protect the originality of the data and prove their ownership over the data. is a type of such scheme that hides owner's information, called digital watermark, in an image.The covert watermark can be subsequently used for the benefit of copyright protection, image proof etc. Whenever there is a conflict over the ownership of an image, the covert watermark must be extracted from the suspected image to prove the rightful ownership. Watermarking can also be used to keep the integrity of the data by detecting any tampering done on data either deliberately or accident. In such a case a crisp watermark is embedded in the image, that gets damaged easily when image is tampered2. The amount and type of destruction in the abstract watermark gives the information about the tamper made to the urinal image. In this paper we abstract on the first type of watermarking, i.e., watermarking for copyright ward of user on image data.

The watermark can either be set in the host image itself or the host image can be encrypted with the watermark without set it explicitly in the host image. In, Balanced Neural Tree has been used to encrypt the secret image with host image, where as in, visual cryptography has been used. The scheme (VC) encrypts the visual data by dividing it into multiple shares. These lot separately do not give any information about encrypted image but when stacked stable, the encrypted image is obtained. Visual cryptography has been worn by sevral researchers for lossless watermarking.

The ratio of two pixels picked at random decides the area of master share and the ownership share is constructed using rules of VC goodbook with master share and secret image. Their issue can toss a larger watermark in a smaller image and is capable to withstand common image processing attacks. Wang and Chen12 have adviced a hybrid DWT-SVD based issue using VC for cop copyright protection. In their issue, first the features are extracted by implementing DWT and SVD on host image. The abstract image features are then classified into two clusters using K-means clustering style, and a master share is design according to the clustering results. Finally the master share and the covert image are used to generate the ownership share using VC good book. The issue is found safe and robust against common image processing attacks. Rawat and Balasubramanian have plan a VC based style employing part fourier transform (FrFT) and SVD in7 First the features are abstract using FrFT and SVD, then a binary map is design using abstract features. Thus design binary map is used to generate master share using VC good book. Further ownership share is constructed using master share and the secret image using VC good book. The issue is found robust against many image processing attacks. The limitations with some of the VC based style is that, false alarms are not negligible for them13.

II. RELATED WORK

There are number of algorithms which are being used to hide the secret in-formation. These algorithms can be classified into two domains called:

A. Spatial domain and

B. Frequency domain.

Spatial domain watermarking slightly altered the dots of one or two randomly selected subsets of an image. On the other side, in frequency domain style the image is first shift to the frequency domain by the use of any shifting methods just as Fourier transform, discrete cosine transform (DCT) or discrete wavelet transform (DWT). Now the adviced is joined to

the values of its transform coefficients. After applying the inverse transform, the selected coefficients form the embedded image

A. Spatial Domain

1. Least Significant bit (LSB)

In this style watermark is insereted in the LSB of dot. Two types of LSB style are proposed. In the first method the LSB of the image was changedwith a pseudo-noise (PN) sequence while in the second a PN sequence was joined to the LSB. This method is easy to use but not very flesh against attacks.

2. Patchwork Scheme

In patchwork, n pairs of image points, (a,b),were randomly chosen. The image data in a were lightened during that in b were darkened .High level of flesh against many types of attacks are lend in this style. But here in this style, very small amount of information can be hidden.

3. Predictive Coding Scheme

In this scheme, a pseudorandom noise (PN) pattern says W(x, y) is join to cover image. It increases the flesh of watermark by increasing the gain factor. But due to high raise in gain factor, image quality may decrease.

B. Frequency Domain

1. Discrete Cosine Transforms (DCT)

First of all image disjointed into non overlapping slabs of 8x8.Then forward DCT is applied to each of these slabs. After that some slabs selection criteria is applied and then coefficient selection criteria is applied .Then watermark is inserted by modifying the selected coefficients and in the end inverse DCT transform is applied on each 8x8 slab.

2. Discrete wavelets transform (DWT)

It is more constant used due to its time/frequency characteristics. Here an image is cross through series of low pass and high pass filters which decompose the image into sub bands of different resolutions. Image is breakdown into four parts, one part is a low frequency of actual image, the one bottom left is vertical details of the actual image, the top right contains horizontal detail of the image , the bottom right `slab contains high frequency of actual image. This style uses wavelet filters to transform the image.

3. Discrete Fourier Transforms (DFT)

It transforms a continuous function into its frequency components. Discrete Fourier transform is scaling, rotation and translation equal whereas the spatial domain DCT and DWT are not RST invariant. So DFT can be used to recover from various geometric

III. PROPSED WORK

***A. Methodlogy*:**

1. *DWT*: discrete wavelet transform (DWT) is a wavelet transform for which the wavelets are discretely sampled. As with other wavelet transforms, the benefit it has over Fourier transforms is temporal resolution: it captures both frequency and location information (location in time).
2. *RDWT*: Redundant Wavelet Transform contains the coefficients of DWT of Shifted Signal. DWT is one of the most commonly taken watermarking techniques because of its excellent spatiolocalization property.But it has a disadvantage, i.e. shift variant occurs due to the down sampling of its bands which leads to a wide change in wavelet coefficient even for a little change in input image. As a result there is an false extraction of host image and watermark image occurred. To reduce this problem, RDWT technique has proposed RDWT method eliminates the down sampling and up sampling coefficients as a result the redundancy is achieved. Thus RDWT based watermarking technique are more robust than DWT based watermarking technique.
3. *SVD*: is a mathematical tool which divided a matrix into 3 matrices. Let A is the image of size M×N, after that the SVD of A is given by A=USVT, where U and V stands for the orthogonal matrices. S stands for a diagonal matrix. The columns of U and V are called as left singular vector and right singular vector of A respectively and shows the geometrical properties of the image.The elements of S are called as singular values of A and are designed in decreasing order. The elements of S are the brightness of the image A. The principal component can be obtain by multiplying U and S of the image. Most of the watermarking technique use the concept of SVD because of two important properties,It consist of two phase:

B. Embeding:

1 Reading image
2 Image decomposition using RDWT (Host image)
3 Image decomposition of watermark image.
4 input: [host,watermark image]
5 output: watermarked image, PSNR value of host and watermarked image

C. Calculation of SVD of Host image: Embeding watermark in host image (Using optimize scale)
Extraction

1. apply attack on watrermark image
2. try to extract watermark image from attacked watermarked image(Reverse DWT)

3. Check NC for extracted watermark image or actual watermarked image and also check PSNR
input: watermarked image
output: extracted watermark image and its normalized correlation(NC) to input watermark image

$$N_c = \frac{(y,\hat{y})\sum_i\sum_j y(i,j)\,\hat{y}(i,j)}{\sqrt{\sum_i\sum_j y(i,j)^2}\sqrt{\sum_i\sum_j \hat{y}(i,j)^2}} \qquad PSNR = 10log_{10}\frac{(Y_{max})^2}{\frac{1}{n\times n}\sum_i\sum_j\sum_i\sum_j y(i,j)\,\hat{y}(i,j)^2}$$

IV. EXPERIMENT AND RESULT\

Here we are working on a image of the size of 256*256 . and the scaling factor α = 0.025.

	PSNR	NC-Without-Attack	NC-With-Attack
Existing	37.660	1	0.774
Proposed	37.676	1	0.776

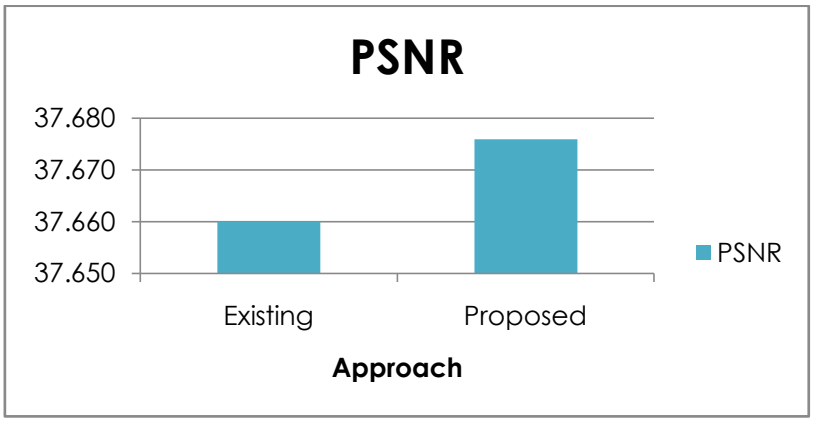

Figure 1: PSNR IMPROVED FROM 37.660 TO 37.676

This is the graph of PSNR of the existing and proposed of image watermarking showing the comparison of existing and proposed work.

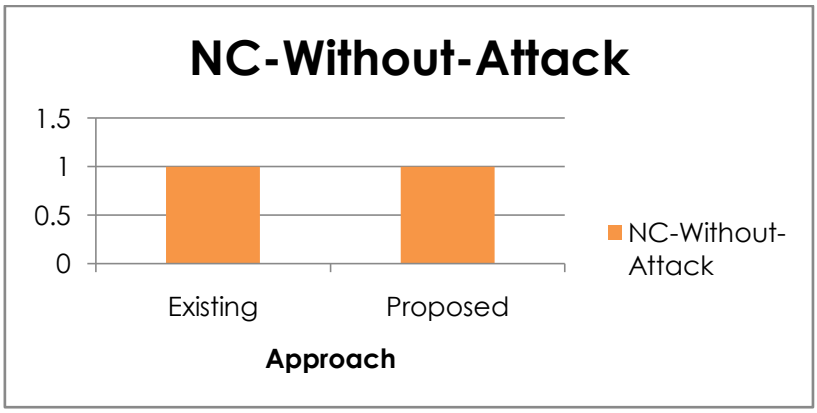

Figure 2: WITHOUT ATTACK NC IS SAME AS IN EXISTING.

This is the graph of NC-WITHOUT ATTACK of the existing and proposed of image watermarking showing the comparison of existing and proposed work.

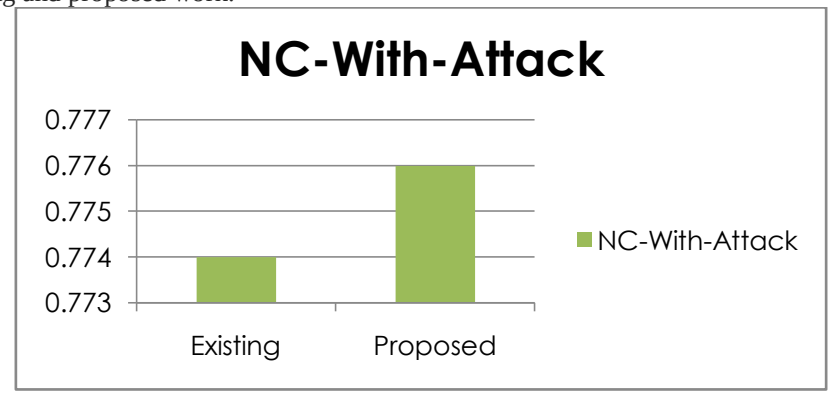

Figure 3: WITH ATTACK NC IS IMPROVED FROM 0.774 TO 0.776.

This is the graph of NC-WITH ATTACK of the existing and proposed of image watermarking showing the comparison of existing and proposed work.

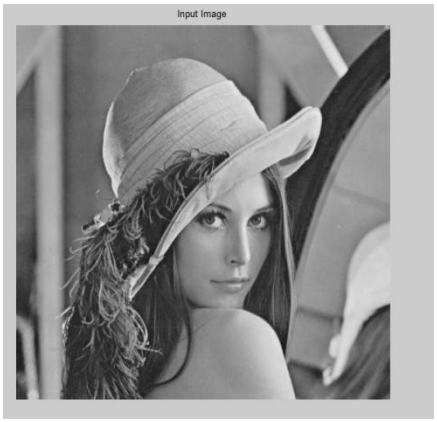

Figure 4: Screenshort of input image

Figure 5: Screenshort of watermark image

Figure 6: Screenshort of watermarked image

Figure 8: Screenshort of input image and watermarked image

V. CONCLUSION AND FUTURE SCOPE

In this paper we increase the PSNR and NC based on RDWT and SVD and various graph can be obtain in MATLAB tool. In the future work can be conducted by increasing PSNR and NC using principle component, scaling factor and multiple dataset and the second approach we can use optimal scaling.

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