Hiding Information Using Random Permutation Based Spread Spectrum Watermarking

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Abstract- In this paper we are using a novel method to generate a random pattern image. This image will be hided into cover image using spread spectrum method. For this Data Hiding we are using two dimensional spread spectrum method so that we can hide the random pattern image into low intensity and mid intensity parts of cover image. Once data hided image, we transfer the data in noisy environment to check the effect of noise on cover image upon random pattern which was hided into the cover image at the receiver end. We extract the watermark from the cover image and quality of cover image and watermark random pattern are compared with the original one. After performing lots of experiments we come to know while transferring data with more number of channels it will be difficult for us to catch and hold data at the receiver's end. But when we transfer the data by using 2, 4 or 8 channels then we will be able to collect all the data with 100 percent accuracy.

Keywords –Spread Spectrum, Watermarking, Random Permutation, PSNR.

I. INTRODUCTION

Data Encryption is always being an interesting field for various researchers. It is always very interesting to hide the data into another data and using this technique you can easily transmit information between two terminals security. This technique is used for data encryption of text data, images and multimedia data. Spread spectrum is one of the most tracking field of determination because in this technique whole data is not decided in a single place of any image, for any material this technique uses discrete wavelet transform to determine the low intensity middle intensity and high intensity parts of image and then Water mark will be insert into low intensity and medium intensity parts of image. All these components are regenerated using inverse discrete wavelet transform [1]. Digital watermarking method hides copyright notices into videos, audios and images. Watermarking is a technique which is used for authentication purpose; it is different from steganography, as steganography is used for hiding data whereas watermarking is used for just authentication purpose. Basically it is a sign which authenticates a particular document, particular audio or particular video [2]. Digital water marking has been proposed in past to copyright some documents to make it more authentic but the major challenge in digital watermarking is while transferring data from one source to another destination. If this watermarking will get corrupt due to some noise and other interference then there may be a problem arise in detection of received data [3].

A very simple example of watermarking is a seal on any document, this is used to verify or authenticate any document that this document has been produced by an authentic person or if it has been sanded by a particular authentic person whose seal is present on the document [4]. This is a type of visible watermarking. But when we transfer this document from source to destination then there may be some other person who can view or distort this seal, so another solution of this problem is that if we can anyhow hide it from the third person who is carrying this document then it will be more secure and safe for the receiver who is receiving it. To do this task in general, we can use a photograph of any object to put this authentic document inside that and shield it for security purpose; this is the type of invisible watermarking. In computer, we can use some logo or image for visible and invisible watermarking. When we want to show the logo or image to everyone then it will be a part of visible watermarking and when we hide that image into the cover document then it will be a part of invisible watermarking [5].

Watermarking may have different types like image watermarking, text watermarking, audio watermarking and video water working. Now days spread spectrum method used for watermarking are most widely used method because of its capability of watermarking in different places. Before spread spectrum method all the data were watermarked in a single place so the noise may affect the watermark easily but in spread spectrum method data is divided into small parts and embedded into different parts of cover image. So, if there is moisture or noise present in the environment then it could affect a very small part of watermark only [6].

II. LITERATURE REVIEW

Here in this paper, represented comparative study of various digital watermarking schemes their performances and their limitations, they also focuses on applications of watermarking schemes in different areas of data transmission [1]. In this paper author presented a unique way to perform the spread spectrum watermarking using multidimensional block slide approach, they also focuses on how the spread spectrum technique mainly help in data transmission in very noisy environment. Experiments they perform on standard images presented in matlab library. They got quite good accuracy while decrypting the input pattern but still they suggest to use more sophisticated methods for further improvement spread spectrum method [2].

Another author Presented a novel approach to perform spread spectrum watermarking have some limitations with respect to quantization and also it perform a lots of test to analyze the standard spread spectrum method in presence of adaptive weighted noise [3]. The authors compare and analyzed various DCT based and LSB based techniques used for watermarking, after analyzing various techniques concluded that, use of spread spectrum watermarking techniques can produce a good result [4]. Here in this paper, author uses spread spectrum technique for the encryption of multimedia data, as the multimedia data accepts lossy type decryption so spread spectrum technique can be applied in such data very easily [5]. In this paper, author presented a unique way for the encryption and decryption of information online; to perform this task they created a client server model and use my SQL data set which was connected using PHP language. Finally, they tested the secure transmission of information from one PC to another PC using spread spectrum [6].

In this paper, author presented a novel approach for watermarking of multimedia data and proposed a two dimensional spread spectrum model which uses chipping sequence for encryption of input data. Chipping sequence is basically combination of bits which can be X-OR with the input data to produce encrypted data. Finally, at the receiver end, encrypted data is again X-OR with chipping sequence to generate original data [7]. Here, author presented log 2 spatial domain method for spread spectrum watermarking in which they used low intensity and mid intensity reasons for embedding the watermark information. They perform this experiment on various standard JPG images and trends a very good accuracy while decryption [8].

In this paper author compares lots of digital watermarking techniques which are used for various applications in security and then compare these methods on the basis of different parameters to analyze the limitation and accuracy of encryption and decryption [9]. Here, author presented a unique way based on genetic programming to perform watermarking of an image and also spreading the information during watermarking. They achieved very good results by performing watermarking and spread spectrum simultaneously [10]. In this paper author presented a novel approach based on perceptual quality metric for watermarking of image. They didn't apply this approach on various multimedia data. The paper proposes a second order statistics based quality metric watermarking after performing experiments on various images, they claims that the method improves the robustness of watermarking [11]. Here, author proposes a novel approach using quantization index modulation for the watermarking of cropped images and performs this experiment on various JPEG images and for the watermarking purpose First they perform DCT to separate the low frequency, middle frequency and high frequency components and finally watermark is embedded into DCT coefficient by using quantization index modulation method [12].

Here, author proposes analytical and practical based approach for watermarking and Data Hiding, they got the major result and focuses on limits and bounds on security and results of watermarking after performing various practical using different watermarking methods [13]. In this paper author first uses a low frequency pattern for watermarking of image then they added spread spectrum signal to the watermark image. These low frequency patterns and spread spectrum watermark are embedded in different parts of image so it will make a robust watermark which can transfer in long distance and it can survive for a long. To separate the low frequency component they use discrete wavelet transform of two levels [14]. In this paper author focuses on various demolishing technique used in noisy environment. To reduce the effect of noise in any image of signal they also concluded that various spread spectrum based technique can perform better in such environment [15].

Another Author proposed a new scheme to perform robust image watermarking includes some correlation-based and spread spectrum based method which can generate robust watermark. The key idea of this technique was to embed the parts of input signal in two different parts of cover image [16]. Here in this paper proposes one novel approach for spread spectrum watermarking, they called it as improved spread spectrum which is an enhanced version of standard spread spectrum technique which can perform more better in noisy environment and it claims that it has good peak signal to noise ratio while applying this technique into various input data [17]. Here in this paper author presented a survey on various watermark removing techniques from original signal. They also done some significant work for image de noising and classify its various approaches according to type of noise and type of methodologies what they use for the noise reduction [18]. This paper also presented different noise removal techniques and claims that spread spectrum Method can perform well in noisy environment [19]. Author uses LSB based watermarking

technique for the encoding and decoding of input data and they claims that the speed of watermarking is very fast in this method. They used another method which uses linear watermarking of image data and they claim that it is more difficult to LSB watermarking but it can perform well than the standard LSB method [20]. In this book author proposes various watermarking techniques used for watermarking of text and multimedia data and also discuss various coding techniques that can be used for watermarking and also compare the results of Different techniques [21].

III. PROPOSED ALGORITHM

3.1 Spread spectrum watermarking algorithm

Step1: Input cover image IN and number of spectrum channels ch for data transmission.
Step2: Resize the image IN into square matrix of size 256 pixels and store in a new variable J
Step3: initialize two new variables R & C and calculate its values as:
R= 256/ch
C = 256/ch
Step4: Generate a random permutation based watermark
for i=1 to R (loop1)
for j=1 to C (loop 2)
Watermark ((i-1)*ch+1 to i*ch, (j-1)*ch + 1: j*ch) = random(i*j);
End of loop 2
End of loop1
Step5: create a noisy watermark
Watermark_N= AddNoise * Watermark
Where, AddNoise is a random gaussian noise
Step6: insert noisy water mark image into cover image by following formula:
Watermark image = α * Watermark_N + (1-α) * cover Image
Where, $0 \leq \alpha \geq 1$
Step 7: Transfer Watermark image using network

3.2 Spread spectrum de-watermarking algorithm

Step1: Receive Watermark image at receiver's end and say it RW.
Step2: Extract Noise from received image
Noise_D = imfilter(RW);
Step3: follow the step 2, 3 and step 4 of encoding process to fine the values of ch, R and C then extract the watermark as:
For i=1 to R (loop 1)
For j= 1 to C (loop2)
Sign ((i-1)*ch + 1 : i*ch, (j-1)*ch+1 : j*ch) = Noise_D ((i-1)*ch+1 : i*ch, (j-1) i*j)
End of loop 2
End of loop 1
Step4: find out the cover image
C_image = Noise_D - sign
Step5: show Cover image C_image and water marked image using sign variable

3.3 Embedding Process

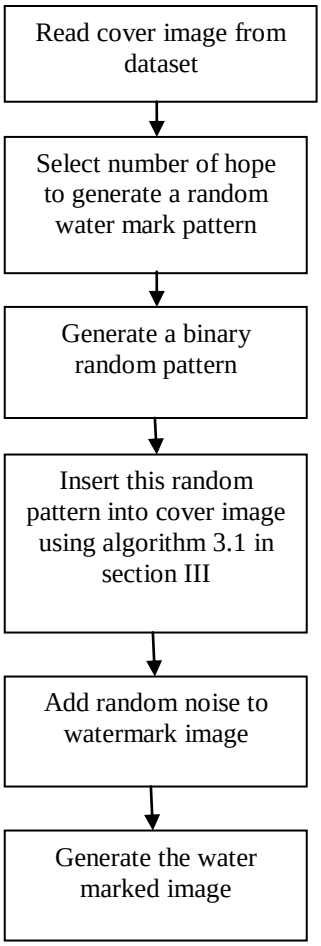

Figure1: Generation of watermarked image using Spread Spectrum

Figure 1 shows the detailed embedding process used for water marking. Here water marked are generated using algorithm 3.1 explained in section III.

IV. RESULT ANALYSIS

After applying lots of experiments, by varying number of channels results are calculated and displayed into figure2, 3, 4 and 5.

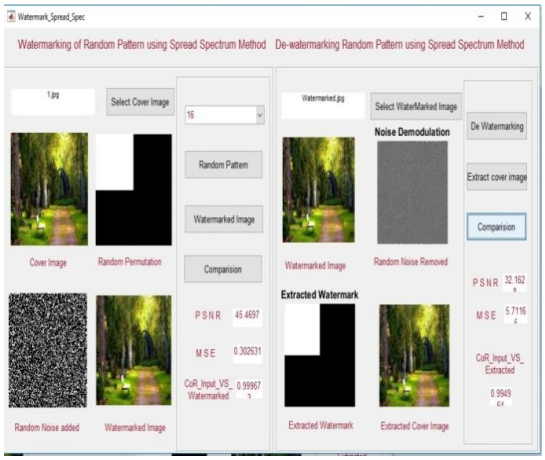

Figure 2: watermarking using 16 channels

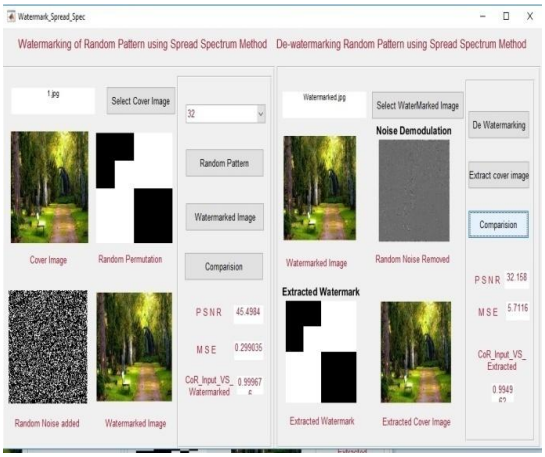

Figure 3: watermarking using 32 channels

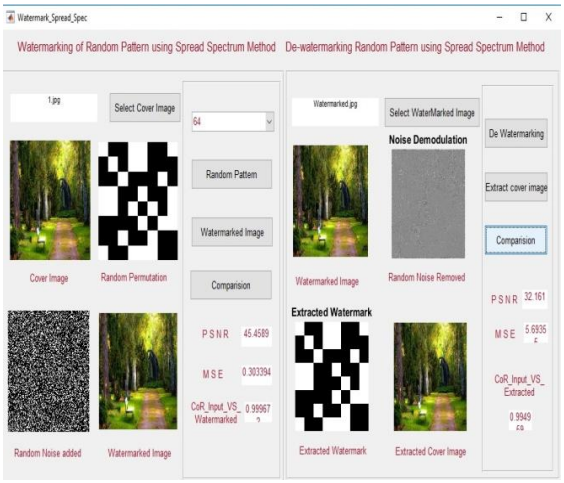

Figure 4: watermarking using 64 channels

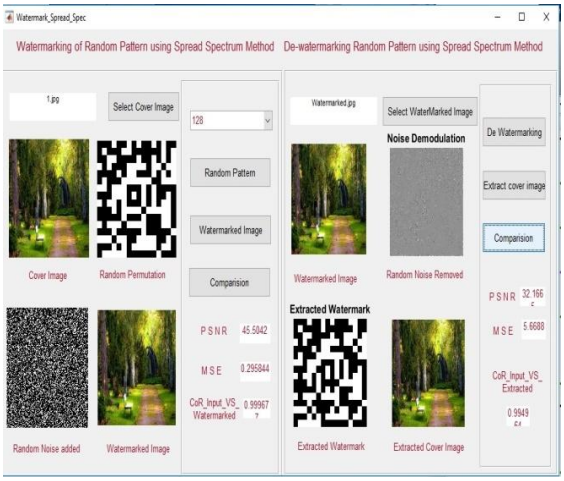

Figure 5: watermarking using 128 channels

4.1. Comparison of Input and Watermarked Image

Table 5.1 and Figure 6 shows the PSNR values comparison of different images while varying number of channels i.e. 16, 32, 64 and 128 channels for transferring the information. The PSNR value is good when number of channels are less, because when information will transferred through less number of channels then it will become easier to collect all the information at receiver's end. Also here we can see that, overall average PSNR value for all the channels is near about 45.34 which shows that input image and watermarked image is almost same. So quality of watermarking is very high and it is almost impossible to visualize the watermark form watermarked image.

Table 5.1 comparison input vs. watermarked cover image

Channels	16		32		64		128	
S.N.	PSNR	NCR	PSNR	NCR	PSNR	NCR	PSNR	NCR
1.	45.4	0.99	44.6	0.99	43.9	0.99	44.6	0.99
2	45.3	0.98	44.4	0.97	43.9	0.98	44.3	0.97
3	45.2	0.99	44.6	0.99	43.7	0.99	44.3	0.98
4	45.3	0.97	44.6	0.97	43.8	0.99	44.2	0.97
5	45.3	0.99	43.7	0.99	43.7	0.97	44.2	0.99

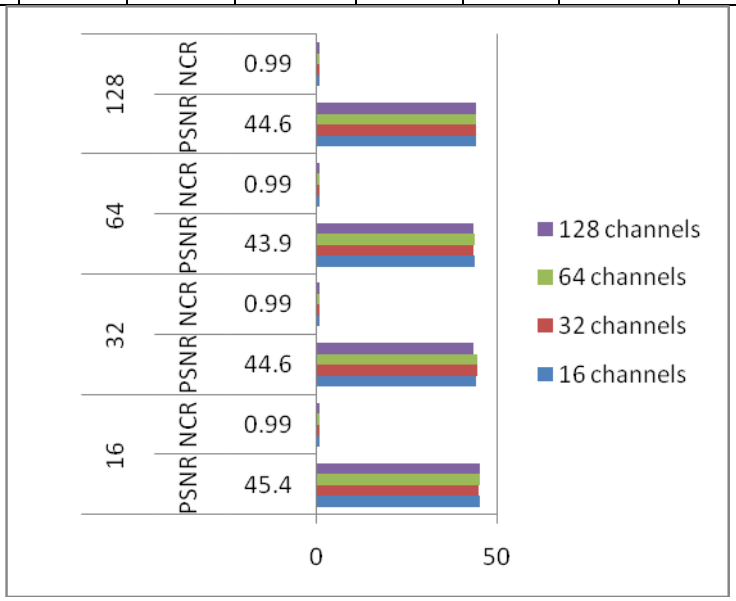

Figure 6: comparison of NCR and PSNR for different number of channels

V. CONCLUSION

The PSNR value is nice when numbers of channels are less; as a result of once info can transferred through less number of channels then it will become easier to gather all the data at receiver's end. additionally here we will see that, overall average PSNR worth for all the channels is close to regarding 45.427 that shows that input image and watermarked image is sort of same. Therefore quality of watermarking is incredibly high and it's virtually not possible to visualize the watermark form watermarked image.

VI. REFERENCES

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