A Survey on Alpha Channel base Invisible Data Hiding Using Compressive Sensing

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***Abstract* - In recent day image ownership authentication has drawn a sharp attention due to easy availability of the internet and inexpensive digital recording and storage peripherals has created an environment where duplication, unauthorized use,and distribution of the digital content has become easier that leads cybercrime. Due to the wide distribution and usage of digitalmedia, an important issue is protection of the digital content.There is a number of algorithms and techniques developed for the digital watermarking. Today already proposed different color image watermarking frameworks for embedding a color watermark within a color input image.An input image is divided into some blocks. In proposed technique use embedwatermark at two LSBs in alpha channel of all such blocks.Although alpha channel is used for controlling the transparency of the image, but two LSB's in the alpha channel are unused bits. In this techniquewe have used these two bits for embedding information. They don't have any contribution in luminance and chrominance factor. For that reason watermark is fully invisible to the Human Visual System(HVS) and no bits are changed in the RGB channel of the input image and for that reason no color information of the input image have been lost. So the color density of the original and watermarked image is same.Use the compressive sensing(CS) method that provides reconstruction of the signal/image.CS can provide good quality of image reconstruction with smaller number of samples and at the same time to detect and extract the watermark. At the extraction end quality of input image and watermark is same as it is.**

***Index Terms*-Digital Image Watermarking, Alpha Channel, Compressive Sensing (CS), Embedding,Detection,Extraction**

I. INTRODUCTION

Intensive growth of digital communication and technologies causes using digital media in everyday life. However,illegal usage and reproduction of digital content have also intensively growth in recent years. Therefore, there is an intensive development of the methods for digital content protection.One method used for protection of digital media is digital watermarking. Various signals can be protected using watermarking techniques: audio and video signals, images,etc[5]. The watermarking procedure consists of watermark embedding and watermark detection and watermark extraction. A signal, called watermark, is embedded into the host data. In order to prove the ownership, it should be detectable within the host data and extract within the host data[7].

Many digital image watermarking schemes have been proposed. Most, if not all, of them use either intensity channel (Y component) or one of the three color channels (e.g., blue channel) as a place for embedding a watermark. Embedding a watermark in the color image's intensity channel is perhaps a mostly adopted choice because intensity change is less perceptible than color change. On the other hand, it does not make use of the other two channels which form complete information about a digital image. By using the alpha channel as a place for watermark embedding as described in our paper, a wider embedding space within a whole color space may be used for the purpose. In particular, this is the case of an image with vibrant color, having comparatively constant brightness (e.g., a graphic-style image)[4].

In our proposed technique, we use alpha channel during the embedding process.Watermarkinginformation is added as digital data to the original host image without changing the intensity and color density of the pixel, and it cannot be perceived HVS.It is highly sensitive to any type of data alteration and tampering can easily be detected[3].

Watermark could be affected by various attacks (such as filtering, compression, geometrical image transformation, etc.) that may significantly degrade the watermarking detection and extraction performances. In this paper, we analyze the watermark detection and extraction under the influence of a new kind of conceptwhich is based on popular, recently developed, Compressive Sensing (CS) concept [7].

Compressive Sensing (CS) is a new approach to the signal sampling. Using different types of optimization algorithms,CS allows signal reconstruction when only small number of samples is available. This reconstruction is possible under certain conditions. Namely, signal should be sparse in certain domain, and samples should be acquired randomly. Two dimensional signals are generally not sparse, in a strict sense .Therefore, in the reconstruction of 2D signals; the gradient is used in the optimization programs. Various algorithms for the reconstruction of the 1D and 2D signals exist: L1-and L2-norm minimization, Total Variation *(TV)* minimization[5].

Alpha channel and Compressive sensing is great importance in digital watermarking process such as embedding, detecting and extracting to guarantee the improving speed and accuracy of image reconstruction and also improving the image quality.In this paper we improve the parameter such as PSNR,SNR and MSE. Also reconstruct the lossless data.

Our framework will also ensure:

- The persistency of quality of watermarked image.

- Watermark invisibility to human visual system.
- The persistency quality of reconstructed image.
- Improve Parameter.
- Improve speed accuracy.
- Reconstruct Lossless Data.

In this paper, Section II describes related work. Section III inwhich describes Background .Section IV in which Problem statement. Section V in which Conclusion and Future Plan.

II RELATED WORK

A. Alpha Channel

The alpha channel is a color component that represents the degree of transparency (or opacity) of a color (i.e., the red, green and blue channels).It determine how a pixel is rendered when blended with another.When a color (source) is blended with another color (background), when an image is overlaid onto another image, the alpha value of the source color is used to determine the resulting color.If blending is transparent, the source color is invisible, allowing the background color to show through.Alpha is known as Transparent channel for which all pixels values of image will be 255 and for background it is 0 value pixel .when we use alpha on image .Image should only be render other part will be clipped off.so alpha is basically subject with either 0 or 1.

The image is appended with an alpha channel plane to form a png image.The appended alpha channel helps in creating a transparency region onto which the recovery data to be used at the recovery stage is embedded into. At the recovery stage, the appended alpha channel is removed once the watermark has been extracted. The removal of the alpha channel brings back the original image without any loss[1].

B. Digital Watermarking

Digital watermarkingis a technique for multimedia data protection, copyright protection, tracking of digital copies, etc. Watermark is the secret signal embedded in the multimedia content in a way that does notmodify the original content. Depending on the type of host signal, different watermarking techniques were introducedaudio watermarking video and image watermarking approaches.Watermark could be embedded either directly into the signal domain, or into some of the transform domains[7].

There is a growing need for multimedia data protection against illegal copying, distribution and misuse of digital content. Watermarking provides copyright protection, monitoring copies of the content, tamper resistance, authentication and annotation. Watermark is secret digitalsignal which can be *1D* random sequence, or can be logo image inserted into the multimedia signal. Embedding can be done in time domain or into some of transform domains and work both, for 1D and 2D signals[5]. Generally the watermark should be imperceptible, secure and robust to all kinds of intentional attacks, such as compressions, noises and geometrical attacks[5].However, there is usually a trade-off between watermark imperceptibility and robustness[7].

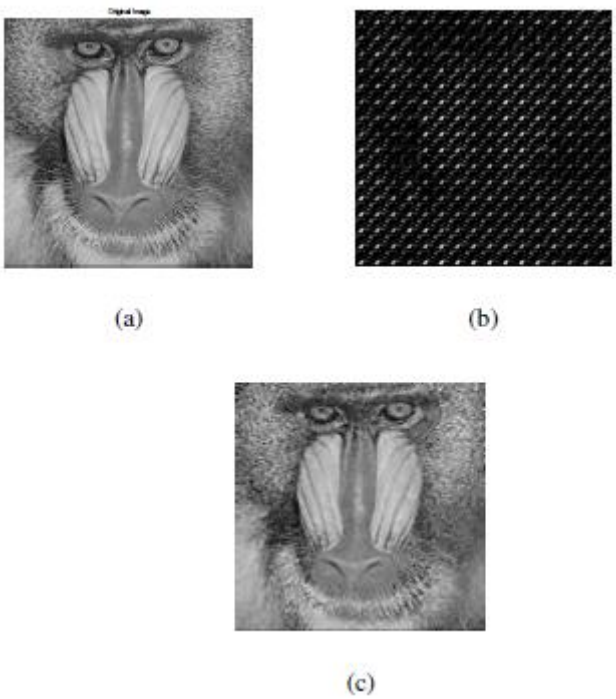
Watermark classification

Watermark can be classified:

- By the human perceptibility to watermark:
  Visible or Invisible.Visible watermark often represents owner logo image.
- By robustness level: Fragile watermarking is watermark implementation in the high frequency part of the spectrum, which can be easily removed by high frequency filter .Semi-fragile watermarking provides resistance to some signal processing techniques. Robust watermarking is watermark that can't be removed without significant degradation of the signal.
- By transform domain watermark implementation is performed. Watermark can be inserted into the multimedia signals in time domain or into some of transform domains such As discrete wavelet transform (*DWT*), discrete cosine transform(*DCT*) or discrete Fourier transform (*DFT)*[5].

C. Compresssive Sensing

Compressive Sensing introduces analternative way of signal sampling that differs from standard sampling approach, based on the Shannon Nyquist theorem. According to the CS theory, the signal samples could be acquired randomly, at the rate which is far below Nyquist. CS is based on the powerful mathematical algorithms used for the reconstruction of missing content. To provide high accuracy signal reconstruction with CS reconstruction technique, certain conditions need to be fulfilled. Namely, the signal has to be sparse in a certain transform domain, which means that the information about the signal is concentrated within a small number of coefficients. The second requirement refers to sampling procedure. The signal acquisition/measurement procedure should be incoherent, in order to provide signal reconstruction with small number of available samples. Reconstructed signal can be obtained by using certain optimization algorithm, which can be based on different norms minimization (l0, l1, l2etc). The optimal solution in large number of applications is provided using l0 -norm minimization. In image processing applications, the commonly used optimization technique is called Total Variation (TV) minimization[7].



(a) (b)

(c)

Reconstruction using MH-BCS-SPL for 'Mandrill' test image of size 512×512 at subrates .
(a) original image (b) Reconstructed image with wrong key
(c) Reconstructed image using right key

III BACKGROUND

Various researchers are working on Alpha channel and CS to find the solution for current watermark embedding, detection, reconstruction and extraction problem.For various technique is used for proper watermark embedding, detection, reconstruction and extraction based on using alpha channel and compressive sensing.

1. A New Invisible Color ImageWatermarking Framework through Alpha Channel.

Invisible Fragile Watermarking technique through alpha channel is used, in which watermarking the information is added as digital data to the original host image without changing the intensity and color density of the pixel,and it cannot be perceived in Human Visual SystemHVS. Moreover it is highly sensitive to any type of data alteration and tampering can easily be detected.At the watermark extraction end, we've used blind extraction method, i.e., neither the host image nor the watermark image is required at the time of watermark extraction.Watermark image is retained intact after extraction.This framework will also ensure the persistency of quality of watermarked image, Watermark invisibility to human visual system, Security issue guaranteed with the secret key and hash function[3].

2. Alpha Channel Digital Image Watermarking Method.

A content-based watermark embedding and detecting method using alpha channel is used. For the embedding process, salient edges are extracted. Then, the watermark is embedded along these edges. The colors of pixels along these edges are modeled as a result of foreground and background colors blending. A watermark is embedded by altering these blending factors.The false alarm rate will increase when the range of the pre-defined alpha value is increased.Method is robust against any kind of distortion.Give the best imperceptibility property.To avoid the problem about the different of extracted edge from the original image and distorted image, we used the global detection by calculating the average alpha value and then used that value as a criterion of detection scheme[4].

3. A Compressive Sensing based Secure Watermark Detection and Privacy Preserving Storage Framework.

This paper proposes a compressive sensing based secure signal processing framework that enables simultaneous secure watermark detection and privacy preserving storage. Our framework is secure under the semi-honest adversary model to protect the private data. Compared to previous secure watermark detection protocols, our framework offers better efficiency and flexibility, and protects the privacy of the multimedia data.watermark detection in the CS domain is feasible theoretically and experimentally.Future work also includes further evaluation of the robustness of the watermark detection in the CS domain under some other attacks. To secure CS transformation, developing MPC protocols for secure CS reconstruction is part of our future work[6].

4. Compressive Sensing as a Watermarking Attack.

CS method is used as the attack on the watermarked image. CS is combined with TV minimization for image reconstruction. The reconstruction using different number of image coefficients for CS measurements is analyzed, as well as the performance of watermark detection under CS attack.CS can provide good quality image reconstruction with reduced number of samples and, at

the same time, to remove the watermark.The additive block/based DCT watermark embedding procedure is observed. Image is reconstructed by using different number of DCT coefficients as CS measurements. Under the CS attack the watermark will not be reliably detected, although the reconstructed image has a high quality, visually very close to the quality of original image[7].

5. Wavelet Based Watermarking Approach in the Compressive Sensing Scenario

Wavelet based invisible watermarking using compressive sensing method is used. Watermark is created as a pseudo random sequence, embedded in the certain region of the image, obtained using Haar wavelet transform. The quality of the reconstructed images has been evaluated using Peak Signal to Noise Ratio (PSNR).Haar wavelet transform is done in two steps, and embedding region is chosen after the second step.Image is reconstructed by using different number DCT coefficients as CS measurements.Reconstructed image has good quality with total coefficients measurement and that watermark detection succeeded.Watermark detection is successful even for the less number of used measurement, but in such cases image quality is visually degraded[5].

6.Image Compressive Sensing Using Overlapped Block Projection and Reconstruction.

A new image compressive sensing scheme using overlapped block projection and reconstruction(OBPR) method is used. The sampling of image is applied on overlapped blocks. In process of reconstruction, enforce the image sparsity in discrete cosine transform domain to improve the reconstruction quality.An efficient augmented Lagrangian based technique is exploited to solve the proposed optimization problem.OBPR provide a significant gain in reconstruction quality over BCS and BCS-SPL.There are many issues that future work should consider. The sparsity degree of a signal in transform domain plays a significant role in recovery while this simply chooses discrete cosine transform. We can try to seek a domain in which the signal has a higher degree of sparsity in future works to achieve better performance[8].

IV COMPARATIVE STUDY

Table: I Comparison between different Alpha Channel and Compressive Sensing base techniques invented in Invisible Data Hiding

Sr No.	Technique Used	Strong Points	Weak Points
1	Invisible Fragile Watermarking technique through alpha channel	Accurate Extraction , Extract Watermark remains intact , Persistency of Quality of image , Invisible HVS	Take more time, Security issue
2	A content-based watermark embedding and detecting method using alpha channel	More robust, Best imperceptibility	Need wider space for embedding, Take more time
3	A Compressive Sensing based secure multiparty computation(MPC)	Secure, Protect the privacy of the multimedia data, Better efficiency and flexibility	Less Robustness under compressive sensing domain for different attacks
4	CS attack on the watermarked image	High quality of reconstructed image	Detection Procedure fails
5	Wavelet based invisible watermarking using compressive sensing	Good quality of reconstructed image, Successful detection	Some cases image quality is visually degraded
6	A new image compressive sensing scheme using OBPR	Better reconstruction quality	Need higher degree sparsity of signal

V PROBLEM STATEMENT

According to the literature review no of method, technique like Quantization,Linearization, Blurring, Interlacing, and DCT.Still not get the proper reconstruction image, Less PSNR, Less accurate

VI CONCLUSION

According to literature review various author have research based on various watermarking technique. In proposed work try to get the maximum accuracy of reconstructed image using alpha channel embedding and compressive sensing also prove result with different parameter like PSNR, SNR, and MSE. In future we can security based work.

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