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A Novel Approaches in Blind Multiple Watermarking for Color Image Using Dct Embedding Techniques

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ABSTRACT
Digital watermarking is equivalent to watermarking physical objects apart from that the watermarking method is used for digital content in its place of physical objects. In digital watermarking the low-energy signal is invisibly embedded in another signal. The low-energy signal is named the watermark and it depict some information, like safety or rights data regarding the main signal. The main signal within which the watermark is embedded is referred to as the cover signal since it covers the watermark. The cover signal is usually a silent image, audio clip, video series or a text document in digital format. In this research study, the algorithm is based on cascade of powerful logical transforms. In this paper we propose a novel method of blind multiple watermarking techniques for color images. To defend the image copyright verification and help to validate the copyright tenure of multiple owners. The cover image information is converted to Red, Green and Blue components image in first step. Green and Blue component of image is transformed in wavelet domain Discrete Cosine Transform (DCT) for decomposition techniques. A binary watermark of 64x64 pixel is embedded into the green and blue components of cover image, is changed block by modifying the some-middle bands significant with AC coefficients using the repetition code. We select sub bands using repetition code and zigzag techniques. The watermark is modified by the scrambling use of Arnold transform. In the proposed paper, robustness and quality is tested with image parameter like Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), and Normalized Correlation Coefficient (NCC). Further, the proposed paper has comparison with related watermarking schemes.
Keywords:- Discrete Cosine Transform (DCT), watermarking techniques, Arnold transform, dual tree complex wavelets transform, image parameters, PSNR, SSIM.

I. INTRODUCTION

Technological up-gradation together in hardware and software are making communication easier and cheap, which in turn, is help to producing huge volume of digital data information being transmitted through the communication medium and internet. This enhancement, in recent years, has formed awareness on the risk of piracy and on the significance of protection of data being shared. Several researches have been listening carefully on the providing solutions to copyright protection and authentication. These methods mainly fall into three categories, namely, Steganography, Cryptography and Watermarking. Out of these, watermarking techniques have gain more attractiveness for proving integrity and accuracy of the owner [1, 2, and 3]. Digital watermarking is define as an algorithm that can be used to cover secret signal into digital audio, video, image or documents in a procedure that does decrease the overall quality of the original signal. The secret signal, recognized as the watermark, can be copyright notice or verification information or secret text. The original signal is called as „cover signal? or „host signal?.The procedure for embed secret signal is called embedding and the picture after embedding is called watermarked image?. Extraction or detection is a strategy retrieves the stored watermark. Therefore, the two most essential components of digital watermarking system are

(i) Embedding as well as
(ii) Extraction.

Digital watermark is used in several applications including copyright safety, fingerprinting, duplicate security, broadcast monitoring and data verification. The watermarking procedure are collection as text-based watermarking [4], image watermarking [5], video watermarking [6], audio watermarking [7] and 3D watermarking [8]. As almost 90% of the content being transmitted in image and video [9, 10], more number of techniques have been developed for these two groups. Regardless of the application, all these techniques have the common goal of protecting digital signal.

II. METHODOLOGY

In this system, we design a customized GUI using the Matlab platform. Here users can easily embed the watermark in the image. In this system, different sections are involved.

2.1 Embedding Process

2.1.1 Cover Image Acquisition

In first stage we take an input a color image. We resize the image into 512x512 pixel size. After receiving the image we decompose the image for better enhancement. After decomposition we separated the layers of color image in R,G and B layers. Each layers have important characteristic and features. We take G (Green) and B(Blue) layers for watermark embedding. We first apply the DCT(Discrete Cosine transform). Here we used 2D-DCT (Discrete Cosine Transformation) is apply in each 8X8 block in 512x512 size images. After apply 2D-DCT transformation we apply zigzag for choosing mid-band frequency.

DCT (Discrete Cosine transform):The discrete cosine transform (DCT) is a technique for converting a signal into elementary frequency components. It is widely used in image compression. Here we develop some simple functions to compute the DCT and to compress images.

Zig-Zag Scanning: The zig-zag scanning pattern for run-length coding of the quantized DCT coefficients was established in the original MPEG standard. The same pattern is used for luminance and for chrominance. Zigzag scan is a part of JPEG compression process that holds important role in grouping DCT process result and quantization values into DC low frequency and AC high frequency components. Zigzag scan contributes to the increase in picture and video compression ratio.

2.1.2 Watermark Image Acquisition

In watermark acquisition we need a binary image, if image have a color layer then we need to convert color image to binary image. Binary image have to element 0 and 1. After acquisition we need to resize the watermark in 64x64 pixel. We used scrambling process for more secure the system. We will we use Arnold Scrambling process in this system.

Arnold Scrambling: Arnold transformation is applied widely in digital image encryption now. It has been one of the most important image technologies in safety transmission and secrecy storage. Arnold transformation has new application lately because of arisen watermarking. The following is Arnold transformation expression in digital image:

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} mod\ N$$
$$x, y \in \{0.1, \dots, N-1\} \quad (1)$$

X and y are the pixel's coordinates in original image, X' and Y' are the pixel's coordinates in scrambled image after transformation. N is the size of image.

2.1.3 Watermarked Embedding Process in green and blue layer

In here scrambled watermark bits with use repetition code for comparison of mid band frequency of cover image. We make a comparison in each layer with new watermark. Now we use inverse zigzag scanning then after we apply IDCT (Inverse discrete cosine transform).

2.1.4 Layer Combination

Now we will merge all three layers R,G and B. we get watermarked image (See in figure 1).

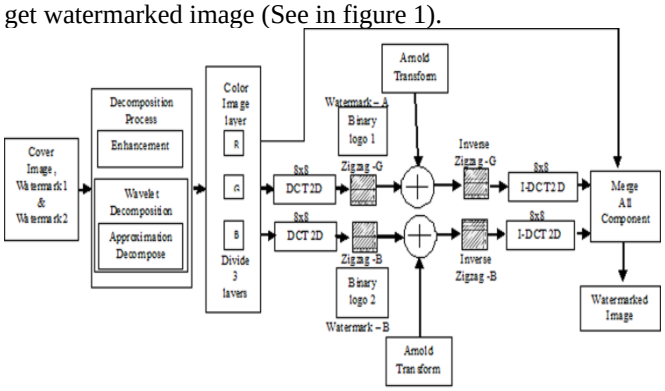

Figure 1. Watermark Embedding process of the proposed system

2.2 Extraction Process

In extracting system we same as convert watermarked image into 3 color component red, green and blue. Now choose green and red layer only for extracting watermark logo, we apply 2D-DCT in each layer and apply zigzag. And select the mid frequency and compare the data.

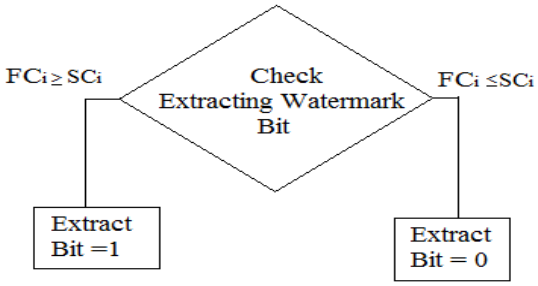

Figure 2: Comparisons of watermarked bits in cover image mid band frequency

Where FCi = 1st Coefficient SCi = 2nd coefficient in the i-th coefficient pair. After then recovered scrambled data using Inverse Arnold transform and now you get your recovered watermarked logo.

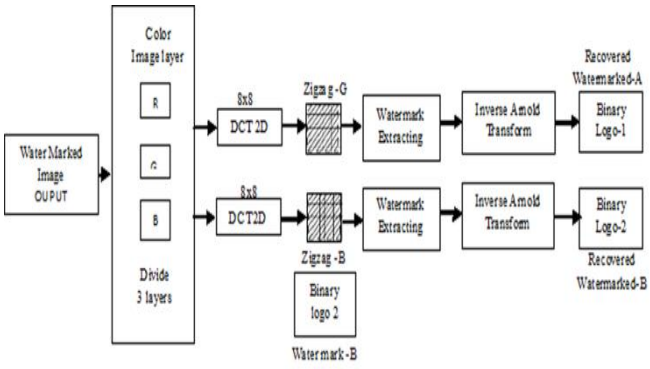

Figure 3: Watermark extraction process of the proposed system

III. TEST AND IMPLEMENTATION

In the test and implementation we use Matlab platform for testing our system approaches. In here we create a GUI (Graphical User Interface) module for easily user connectivity. We trying to analysis here different spatial parameter of watermarked image. We create a three model in GUI, each module have important responsibility in our project.

3.1 Module 1: Multiple Watermark Embedding in Cover Image

In this GUI model we trying to embed watermark secret images into cover image. Initially we load color cover image, where secret data would be hide. When we successfully load image then we decompose the wavelet coefficients of image. Then we separate the image component in three component factor Red, Green and Blue. Red layers use in last of the process. We take green and blue component layers for process execution.

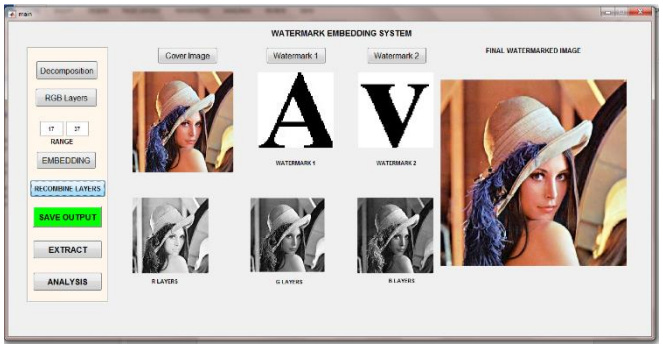

Figure 4: Embedding Module of the Implemented project

We also load two binary watermark image. If we have not any binary image then our system convert any color image to binary image. Watermark binary secret image scrambled by Arnold transform for encryption with strong security in our project. We select the cover image mid band frequency 17 to 37 and use repetition code for embedding the watermark in green and blue layer component. Now we apply inverse zig-zag for conversion the reshape data by 1-dimensional to 2-dimensional. Now apply 2D-IDCT for reform the image. After this , we merge green , blue and red layer , and got a watermarked image. Save the image in directory for future use.

3.2 Module 2: Watermark Extracting Process:

The watermark can be extracted from the watermarked image by using the same technique used in the embedding. Extraction can be done with the presence of the host image or the absence of the host image depending on the watermarking system. A private (non-blind) watermarking system [12] requires that the host signal be present at the decoder in order to extract watermark information. In contrast, a public (blind) watermarking system does not require access to the host signal in order to decode the watermark. The terms private and public also indicate, to a degree, the intended audience of watermark data transmitted through a host signal.

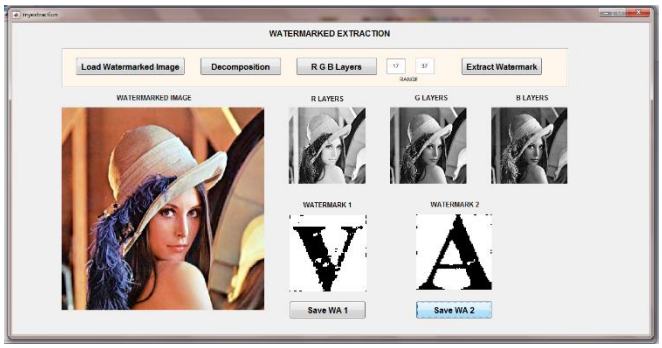

Figure 5: Watermarked Extraction process of Implemented project

In this module we only use watermarked image. We doesn't require host image. Because we work on blind watermarking system. At the first stage we load the Watermarked image with help of GUI browse button. When image is load then we decompose and enhance the image. Now the image is separated with Red, Green and Blue image components layer. We know our system hide watermark in Green and Blue layer. So, we take green and Blue in the process. We use same as embedding process, but it's are reversed. In first we apply 2D-DCT techniques. Now same as apply the Zig-zag scanning for conversion the 2D to 1D data. Now use inverse repetition method. Then apply the inverse zig-zag for generate 64x64 pixels data, apply the inverse Arnold for decryption the image. And apply transpose for get real watermark image in each layer.

3.3 Module 3: Image Analysis for Secret Image with Extracted Secret Image

We also measure the efficiency in protected images after extraction.

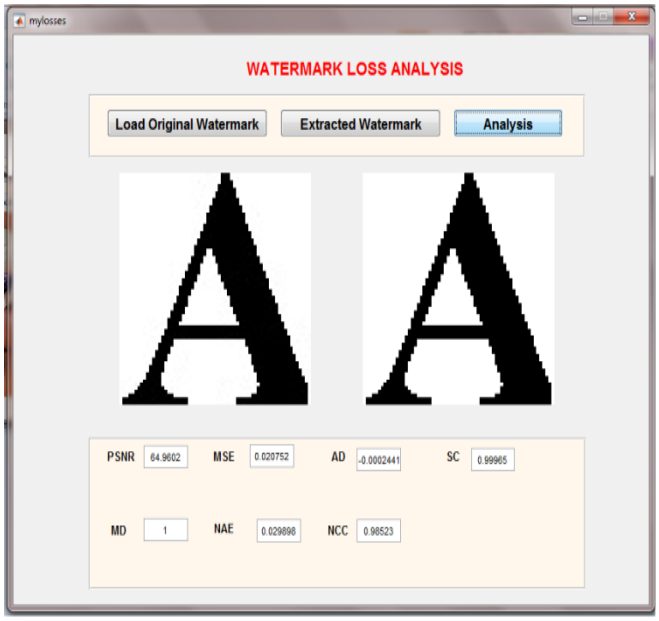

Figure 6: Comparison between extracted watermark and original watermark

IV. RESULT

In our system we used DCT based reversible repletion data hiding technique. Here we hide64x64pixel multiple binary image in 512x512 pixel cover image. For increase security we add Arnold transform multilevel security in this system. In our system we measure the quality of data after extracting.

Table 1: Analysis of Output Extract data with original data

Watermark	PSNR	NCC	MSE	NCC	AD
Sample1.png	64.023	0.9956	44.256	0.8896	0.051212
Sample2.png	63.653	0.9855	31.523	0.8956	0.051314
Sample3.png	65.345	0.9789	34.568	0.9657	0.051533
Sample4.png	62.332	0.9972	33.464	0.8865	0.051585
Sample5.png	66.231	0.9526	41.564	0.8796	0.051514
Sample6.png	67.231	1	33.298	0.8859	0.051898
Sample7.png	61.653	0.9685	38.564	0.9635	0.051726
Sample8.png	56.983	0.9289	37.784	0.8977	0.051134
Sample9.png	66.114	0.9996	38.564	0.9525	0.051527
Sample10.png	65.439	0.9889	40.578	0.9653	0.051234

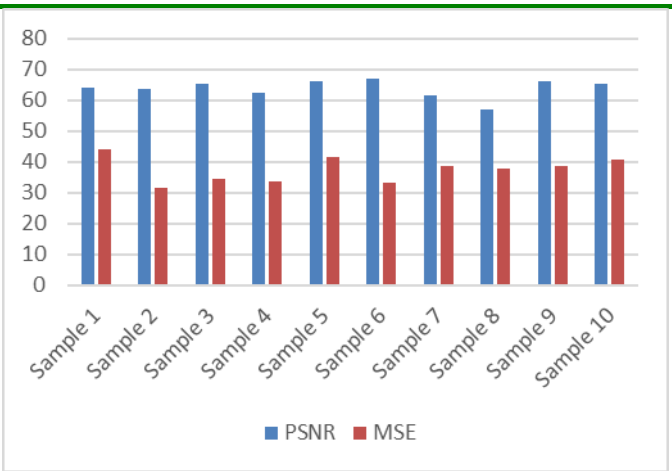

Figure7: Chart for Compare all sample

In table we see the high PSNR value for better watermark recover in extracting process. Our system works on binary secret data hiding technique with highly secure method. Our system successfully hides multiple binary image data in color image using of DCT with repetition technique.

V. DISCUSSION AND CONCLUSION

In this paper, a detailed investigation of image watermarking process by handling it as an optimization procedure based on DCT and Arnold is implemented. This system finds a way to embed secret information in Multimedia file without changing its quality. We create an innovative system here we can easily hide our multiple watermark secret data in color cover image. This system is based on DCT and repetition code technique. We try to embed also a secret image, So this system is multilevel steganography system. We extract the data where we can minimum loss in image. Our system helps in multiple secret image hiding technique in digital area. The watermarking technique of spatial domain by using Arnold is introduced to determine the positions embedded with watermark. Then, one can make full use of the scrambling feature of scrambling to evenly distribute the watermark into the whole space of carrier image. Through increasing the secret key parameters, the security degree is improved efficiently. It not only realizes the imperceptibility of watermark, but also deduces the quantitative extraction rules reversely. So the process will implement the blind extraction of watermark without depending on the original carrier image.

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