

## Image Watermarking Algorithm in DWT Domain

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**Abstract:** To authenticate the given image is important task in the internet communication. For this the technique is proposed in this paper. The original image is first converted into the gray scale image. Then consider the Y component of the given image get divided into different block size i.e. (2x2, 4x4 or 8x8). The Y component is get divided into 2 level decomposition. With the help of the canny edge detector we can get features to generate the watermark. By using this we get the watermark which is used for embedding in the given image. The arnold transform is used to remove the space relativity in DWT. After extraction process with the help of key we authenticate the given image. There is no degradation to the original image. Experiments shows that system is useful to get authentication requirement.

**Keywords:** Discrete Wavelet Transform; contour authentication;

### I. INTRODUCTION

As the electronic media is get popular for communication, the secure communication is the important task in electronic media. Now a days there are large techniques available with different technologies. among them authentication is the important task for secure communication. On the basis of authentication we can able to find out the authorized user, image or data.

There are number of existing technique which provides the authentication on which we can find the authorized data. The most important technique used for digital data authentication is encryption i.e. public key encryption which is also called traditional method of authentication. Another technique available is watermarking. Digital watermarking is a technique which hide some logo or data in the given image so that we prevent copyright, integrity and/or the authenticity of the original data [1-2]. Usually, a robust watermarking is used to protect the copyright while a fragile or semi-fragile watermarking is used to verify the authenticity [3-4]. Authentication of image data is a challenging task. Content modification or tampering is defined as an object appearance or disappearance, a modification to an object position, or changes to texture, color or edges. Image watermarking algorithm used to detect tampering has several essential properties. First is transparency. The embedding processing should not degrade the quality of the original digital media and should be perceptually invisible to maintain its protective secrecy and sensitivity. The embedded watermark is robust to resist normal image processing (such as JPEG compression) while it is fragile to malicious tampering to image content. The watermark is embedded in a secure way and it can't be removed illegally [5-10].

We propose the new technique of authentication in which we can use the watermark which is generated from the same cover image. Watermark is generated with the help of DWT method for the contour image and apply the arnold transform for the given image. The watermark which is generated is stored into LH or HL band so we get the standard result.

This paper is organized as follows: Section 1 introduces related works. Section 2 details the system diagram & workflow steps. Section 3 details the detailed steps. Experiments are presented in section 4. Finally, conclusions are drawn in section 5.

### II. SYSTEM ARCHITECTURE

The design of given system is basically divided into the two steps. In this first is watermark embedding and second watermark extraction. As we are going in detailed we found some properties of image make the watermark embedding as easy task.

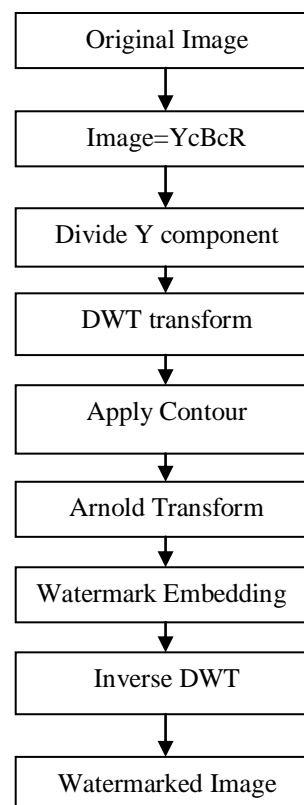


Figure 1: Watermark Embedding process

The above diagram for the watermark embedding and details of the diagram are given in the mathematical model.

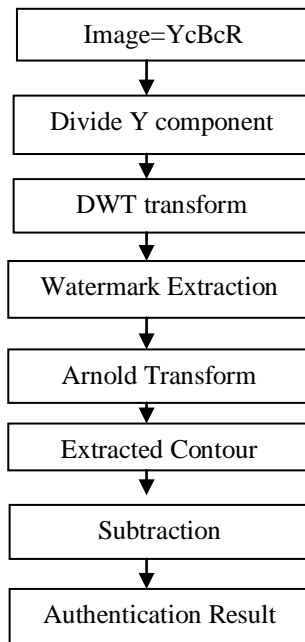


Figure 2: Watermark Extraction Process

As watermark is embedded we need to extract the watermark. Block diagram for the watermark extraction are shown above.

### III. DETAILED DESIGN

#### 1. Watermark Embedding Process

The watermark embedding process is shown with following steps:

- Step1. Original image is converted into YcBcR color space.
- Step2. The subdivision Y is divided into 4x4,2x2 and 8x8 image blocks. Then perform two-level DWT transform block by block.
- Step3. The image contour is calculated based on sub-band image LL2 using Canny edge detector and then filtered to get a binary image as a watermark.
- Step4. Watermark image is Arnold transformed to increases the security of watermarking algorithm greatly.
- Step5. The middle coefficients of first level DWT transform HL1 and LH1 are selected to embed watermark bits.
- Step6. Apply the inverse DWT transform to all the blocks to get the watermarked image.

After embedding the watermark PSNR is calculated for all these three blocks size.

#### 2. Watermark Extraction Process

- Step1. Original image is executed two level DWT transforms to calculate the contour image W using Canny calculator just like the operations in watermark embedding.
- Step2. The watermark information is extracted from middle coefficients which are selected to embed watermark . Construct the watermark image by

the inverse displacing, and we get the extracted watermark image W\*.

$$D(i,j)=|W(i,j)-W^*(i,j)|$$

where i,j denotes the rows and column number.

Step3. The calculated image and extracted image is subtracted, the result will be used to authenticate image content.

### IV. EXPERIMENTAL RESULTS

The experiments in this paper are tested with MATLAB 7.0. The original image used to test is a 512x512 image.

#### 1. PSNR

The PSNR rates for all three images are calculated. From the results we found that 8x8 block shows good authentication results. Also if we go for compression the PSNR rate is decreases.

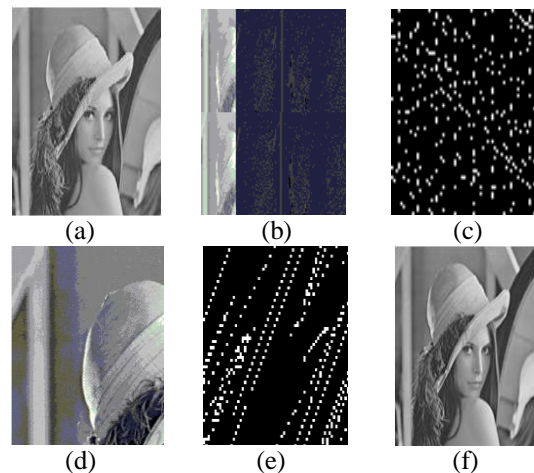


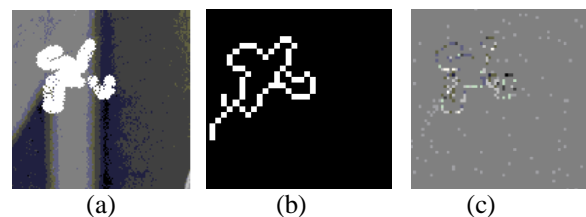
Figure 3: Perceptibility Test (a)Original Image (b) 2-level DWT (c) Contour Image (d) Selected area (e) Inverse DWT (f) Watermarked Image

TABLE1: COMPARISION OF PSNR

Block size	Watermark Region	PSNR
2x2	LH or HL	47.94
4x4	LH or HL	58.36
8x8	LH or HL	65.07

#### 2. Operational Test:

In the different operational test we found the given algorithm is best for paste attacked image.



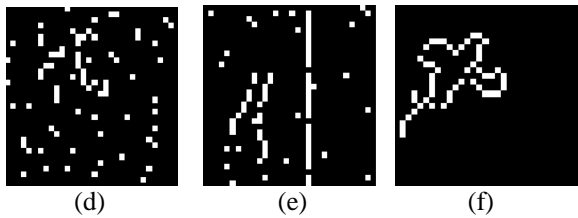


Figure 4: (a) Original Image (b) Canny Image (c) Gray scale Image (d) Arnold Transfer (e) Inverse DWT Authentication

From the above results we can say that our algorithm is sensitive for the authentication of watermarked image.

## V. CONCLUSION

In this paper we used DWT transform method for watermark embedding. Also due to arnold transform space relativity is get reduced. From the above result we can say that algorithm which is proposed here is good as compared to previous one.

In this particular algorithm we can use any logo or another image as the watermark to embed in the given region. So it is easy to improve the result by such experiment.

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