AN EFFICIENT DIGITAL COLOR IMAGE WATERMARKING ALGORITHM

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***Abstract*—** A new digital image watermarking technique which is based on multi resolution DWT & used a Modified LSB watermarking embedding algorithm is proposed in this paper. The color watermarked image is obtained & watermark can easily be extracted in both clean and noisy environments. Experiments are performed to verify the robustness of the proposed algorithm. The result shows that the proposed algorithm is better than other existing algorithms in terms of providing a high PSNR. It is also shown that the proposed algorithm is highly robust against various kinds of attacks such as noise, filtering, cropping & rotation.

Keywords— Watermarked, PSNR, MSE, DWT, IDWT, RGB

I. INTRODUCTION

Digital image watermarking has become a necessity in many applications such as data authentication, broadcast monitoring on the Internet and ownership identification. Various watermarking schemes have been proposed to protect the copyright information [1].

With the mostly use of the Internet and the rapid and recent advanced development of multimedia, there is an impending need for efficient and powerfully effective copyright protection techniques. Digital watermarking is typically classified into three categories. (1) Private watermarking technique which requires the prior knowledge of the original data or information and secret keys, at the receiver, (2) Semi-private or semi-blind watermarking technique where the watermark information and secret keys may be available at the receiver, and (3) blind watermarking where the receiver must only know the secret keys [2].

Digital color image watermarking can also be used for controlling the creating of illegal duplicate copy of the original source of data. With help of my proposed algorithm it is useful to track the customer who illegally distributes the digital images in the market. So with my proposed watermarking system we can easily trace those distributors who create multiple copies of the original image or data in an illegal way. This can easily been done by embedding the some sign or lobo as watermark into the host image. When an

illegal copy is found then the watermark information is extracted from the host image.

II. LITERATURE REVIEW

Hamidreza Sadreazami et.al: Authors proposes an Multiplicative Watermark Decoder based on Contourlet Domain. Basically contourlet coefficients of an image are highly non-Gaussian and a proper distribution to model. The proposed watermark extraction approach is developed using the maximum likelihood method based on the NIG distribution. Authors performed to verify the robustness of the proposed decoder. The result shows that the proposed decoder is better than other decoders in terms of providing a lower bit error rate. From the author's results it is shown that the proposed decoder is highly robust against various kinds of attacks [1].

Zhao Jian et.al has proposed A Watermark Technique Based on Extended Shearlet And Insertion. In this algorithm firstly, 1-D extended discrete shearlet transform decomposes of the test image. Next, the directional component whose information entropy is the highest is selected to carry watermark. Compared with existing related algorithms based on DWT and DCT, the author's proposed algorithm tends to obtain preferable invisibility when it is robust against some common attacks & gives the better results in terms of PSNR [3].**Koyi Lakshmi Prasad et.al has proposed "A Hybrid LWT-DWT Digital Image Watermarking Scheme".** In this proposed article authors present an efficient and hybrid approach. The hybrid approach consists of lifted wavelet transform (LWT) and discrete wavelet transforms (DWT) which is based on linear support vector regression (LSVR) and QR-factorization for watermarking. Precisely the integrated hybrid approach produces less distortion rate. The experimental results are analyzed with other models and offers high reliability on watermark embedding and authenticity along with less computational cost [7].

III. WATERMARKING TECHNIQUE

In general digital watermarking involves two major operations: (i) watermark embedding, and (ii) watermark extraction. For both operations a secret key is needed to secure the watermark. The secret message embedded as watermark can almost be anything, for example, serial number, mobile number, video frames, image, logo etc. The most important properties of any digital watermarking technique are: robustness i.e. watermarking technique should be robust to various types of attacks, security i.e. watermarking technique should be secure so any unauthorized person is not be able to read, modified or destroy embedded watermark, imperceptibility so that quality of the watermarked image should not be destroy, and effective .

Watermarking techniques can be classified according to the nature of data (text, image, audio or video), or according to the working domain (spatial or frequency), or classified according to the human perception (robust or fragile) as shown in figure 3.1. In images, the watermarking techniques can broadly be classified into three types: (i) visible watermark, (ii) invisible watermark and (iii) invisible robust watermark [5].

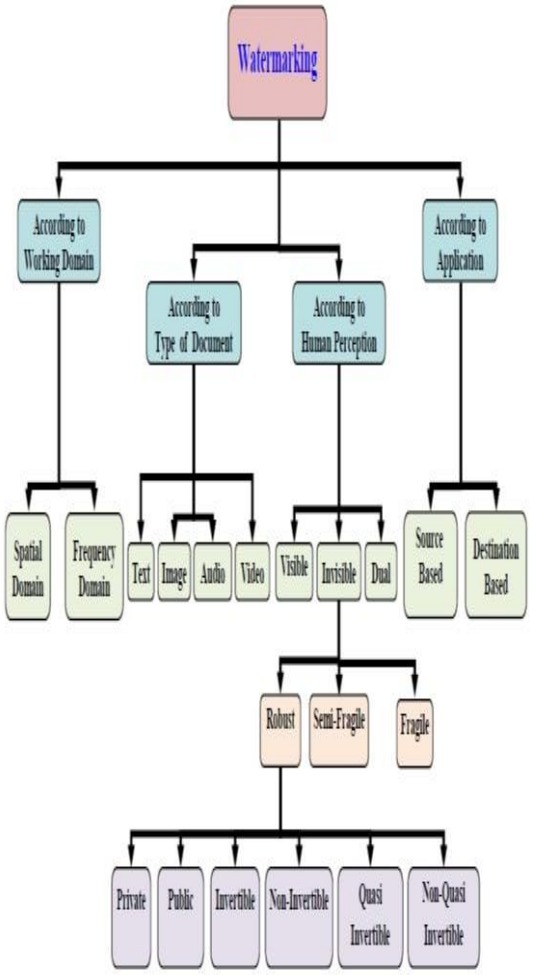


FIGURE 3.1: CLASSIFICATION OF WATERMARKING TECHNIQUES

IV. DISCRETE WAVELET TRANSFORM (DWT)

Discrete Wavelet transform (DWT) is a mathematical tool which is used for hierarchically decomposing an image. It gained widespread acceptance in the field of image watermarking. It decomposes an image into a set of basic functions, called wavelets. Discrete Wavelet Transformation is very suitable to identify the areas in the cover image where a secret image can be embedded effectively. The DWT splits the image into sub-band coefficients such as high and low frequency parts. The low frequency part contains coarse information of images while high frequency part contains information about the edge components. In two dimensional applications, for each level of decomposition, we first perform the DWT in the vertical direction, followed by the DWT in the horizontal direction. After the first level of decomposition, there are 4 sub-bands are generated. For each successive level of decomposition, the LL sub band of the previous level is used as the input [8].

V. PERFORMANCE EVALUATION PARAMETER

The PSNR computes the peak signal-to-noise ratio, in decibels, between two images. This ratio is often used as a quality measurement between two images The Mean Square Error i.e. MSE and the Peak Signal to Noise Ratio i.e. PSNR are the two parameter which is used to compare image quality. The lower the value of MSE the lower will be error & higher the PSNR quality of image is better.

MSE is defined as:

$$MSE = \frac{1}{mn} \sum_{i=0}^{m-1} \sum_{j=0}^{n-1} [X(i,j) - Xc(i,j)]^2$$

Where, X(i,j) = original image

Xc(i,j) = compressed image

PSNR represents a measure of the peak error & is expressed in decibels. It is defined by:

$$PSNR = 10 \log_{10} \frac{255^2}{MSE}$$

VI. PROPOSED METHODOLOGY

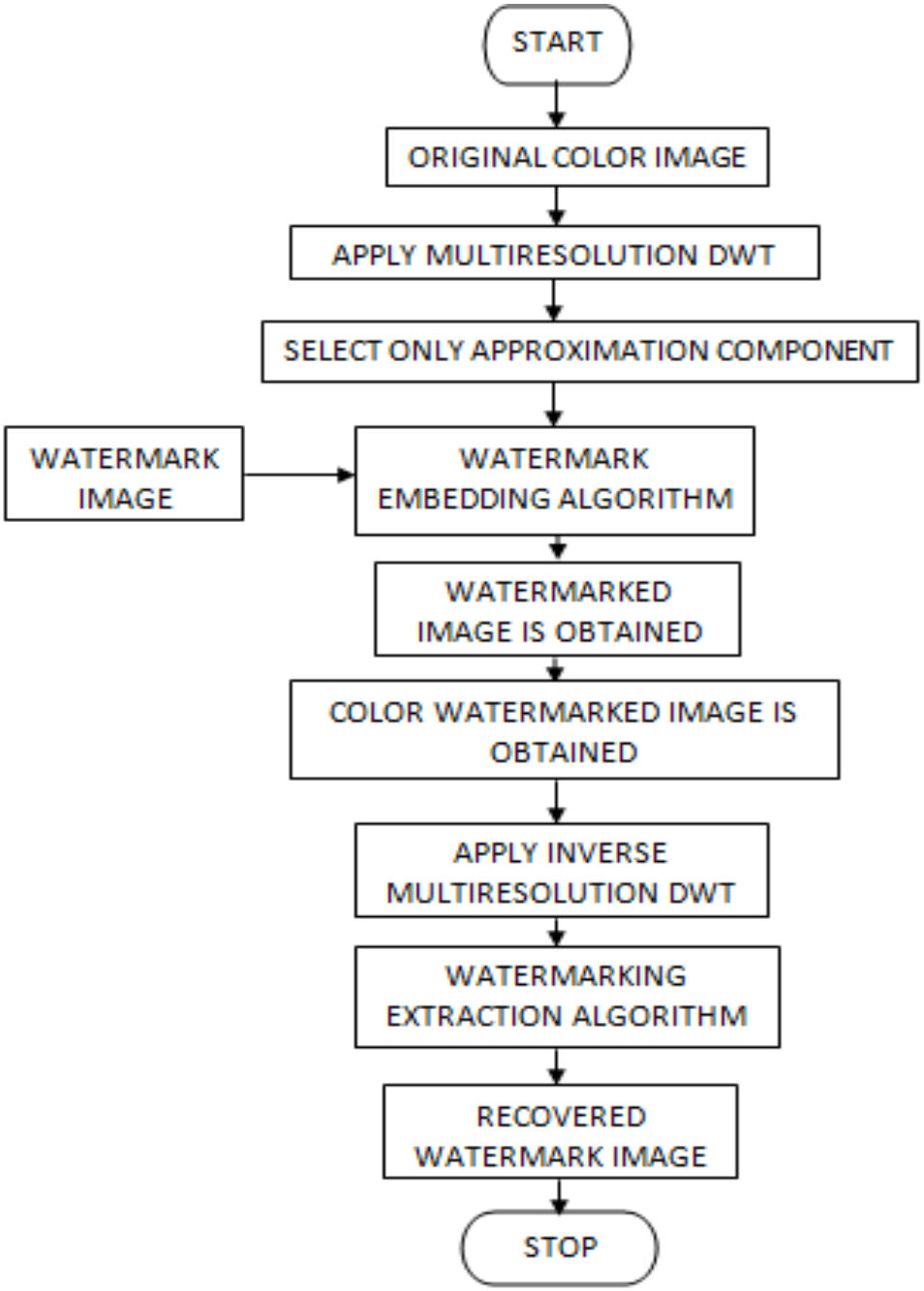
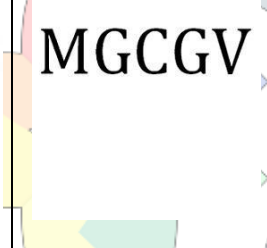
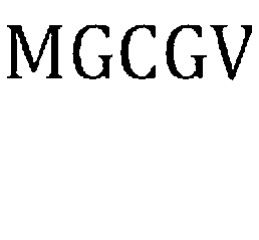
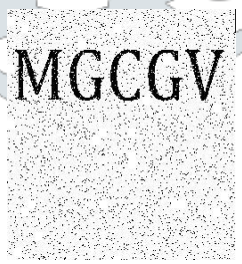
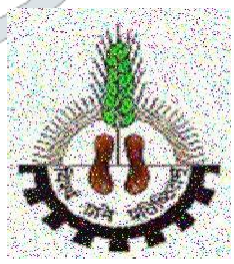


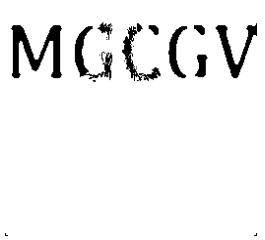
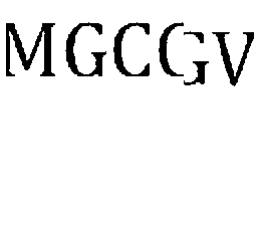
FIGURE 2: FLOW CHART OF PROPOSED WATERMARKING ALGORITHM

VII. EXPERIMENTAL RESULTS

Robustness is a default measure which is used to evaluate the performance of the proposed watermarking algorithm against various types of attacks such as salt & pepper noise, filtering, cropping, and rotation.

TABLE 1: PSNR and MSE comparisons of test image 1 between the proposed scheme and the algorithm in [1].

S.No.		PROPOSED WATERMARKED IMAGE		PROPOSED EXTRACTED WATERMARK		ALGORITHM [1] WATERMARKED IMAGE		ALGORITHM [1] EXTRACTED WATERMARK	
	ATTACK TYPE	PSNR	MSE	PSNR	MSE	PSNR	MSE	PSNR	MSE
1	NO ATTACK								
		59.48	0.0923	58.89	0.076	55.58	0.153	50.22	0.6176
2.	SALT & PEPPER NOISE								
		52.79	0.341	50.82	0.789	49.14	0.793	48.19	0.886

3.	MEDIAN FILTER								
		55.89	0.167	51.98	0.799	50.12	0.781	49.81	0.994
4.	CROPPING								
		51.22	0.7167	52.54	0.652	48.78	0.983	46.21	1.081
5.	ROTATION 10^0								
		56.79	0.341	53.82	0.599	49.67	0.811	48.99	0.986

VIII. CONCLUSION

In this paper, a new method multi-resolution DWT based watermarking algorithm has been proposed. To investigate the robustness of proposed algorithm, different images with different intentional and unintentional attacks were employed. PSNR values are estimated for all the images. Comparing these PSNR values with that obtained by earlier conventional approach it can be concluded that the fidelity of the watermarked image is improved with the proposed method. It has been also shown that the performance of proposed algorithm is highly robust against common attacks such as salt & pepper noise, median filtering, cropping & rotation.

XI. REFERENCES

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