Spatial Domain Visible Color Image Watermarking

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Abstract—This present stage of day to day affairs, the protection of data and legalisation is very important. Data authentication in image are achieved by watermarking .Watermarking is a technique for embedding hidden data that attaches copyright protection information to digital information. This provides an indication of ownership of the digital data. The proposed scheme employs a spatial domain visible colour image watermarking for improve the security and authentication. Pixel Mapping Method (PMM) is used in this proposed work. In this scheme using two parameters for scaling and embedding of an images. The quality of the watermarked images is analysed by comparing some parameters with original image. The proposed approach results in high value of PSNR between host image and watermarked image.

Keywords — Spatial domain watermarking, Visible image watermarking, Pixel mapping method, Peak signal to noise ratio.

I. INTRODUCTION

Digital media such as image, video, audio, etc. are now widely distributed over the Internet. Because of easy reproduction and manipulation of data of digital standards, protecting the intellectual property rights has turned out to be an important issue. Digital watermarking is expected to be a perfect tool for protecting the intellectual property rights. The main advantages of watermarking over other techniques are: They are imperceptible. They are not removed when the data are converted to other file formats. They undergo the same transformations as the data in which they are embedded.

Watermarking is a technique for embedding hidden data that attaches copyright protection information to digital information. This provides an indication of ownership of the digital data. Watermarking is closely related to steganography in that they are both concerned with covert communication and belong to a broader subject known as information hiding. In visible watermarking, the data is evident in the image or video. In general, the watermark can be a text or a logo, representing the owner of the original data. The image has a visible watermark after it is embedded. When a television broadcaster adds its logo to the corner of transmitted video, this also is a visible watermark. Digital watermarking algorithms can also be grouped into two main categories based on the domain spatial domain methods and frequency domain methods.

Spatial domain methods insert the watermark information in the luminance and/or chrominance values of the pixels. Spatial Domain techniques are extremely simple to construct and design and they give a perfect reconstruction in the absence of noise as illustrated in the results. There are numerous techniques proposed in spatial domain embedding manipulating the Least Significant Bits, making use of the luminance components, manipulating the Intensity Components, Image Differencing, etc. Spatial Domain Watermarking for colour images can be implemented by directly manipulating the pixels or intensity values of the image itself to acertain extent. This work incorporates the exploitation of the luminance component of the image where visual imperceptibility is being maintained. The blocks containing the highest luminance values are calculated to determine the embedding location. The watermarks are then embedded into the selected locations and the image reconverted back to obtain the original watermarks. During extraction, the original image and the watermarked image are compared to retrieve the encrypted watermark bits.

II. LITERATURE SURVEY

One commonly used spatial domain technique is the Least Significant Bits (LSB) technique [1]. In this technique the watermark is embedded in the least significant bits of some randomly selected pixels. Given an image with N×N pixels, and each pixel being represented by an 8 bit sequence (s_1, s_2 …., s_8), the watermarks are embedded in the last (i.e., least significant), bit, s_8 of selected pixels of the image. Though, this method was easy to implement and does not generate serious distortions to the image, it was not very robust

against attacks. An attacker could simply randomize all LSBs, and destroy the hidden information.

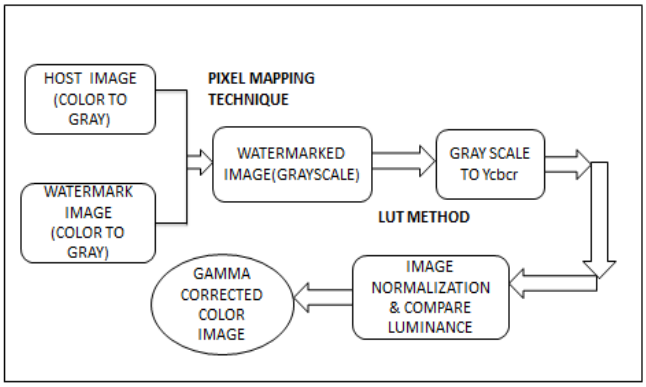
In 2013, Kranti Burman, Rahul Gedam [2], analysed to eradicating the malicious attacks on robust digital colour image watermarking for colour image authentication and also minimizing image distortion by using LSB substution.The proposed scheme embeds watermark in 3 bit planes by changing original pixel with watermarked pixels. It gives RGB histogram of original image or watermark image seperately. The experimental results shows enhancement in visibility and robustness of watermark by calculating the PSNR value of image. In 2009, Nagaraj V. Dharwadkar, B.B. Amberker [3], proposed spatial domain LSB based watermarking algorithm for colour images. This algorithm is used for both visible and invisible watermarking. It also introduce the concept of storing variable number of bits in each pixel depends on actual colour value of pixel. The RGB channels of the colour image has been used for watermark embedding. The proposed algorithm coordinate high watermark embedding capacity which is equal to size of cover image. The security of watermark is obtained by aligning the watermark bits using secret key. It identify to robust to various image processing operation.

In [4], the watermark is embedded into specific blocks of thehost image, where the selection of blocks is based on entropy value. This method was also tested using PSNR and the result of PSNR is compared with different insertion blocks of the host image. The PSNR value was 65.7059 for 1block and 59.7102 for 4 blocks. In this paper [5], proposed a type blind and invisible watermarking in spatial domain is proposed. A binary watermark image is permutated using a secret key and the host image is divided into five blocks each of size equal to the watermark image.

The watermark then embedded into five blocks of the host image by altering LSB values of the selected region. Only one watermark will be selected by performing OR operation. The proposed scheme was proved to be robust to various image processing operations such as salt and pepper noise, and cropping. In [15], the color watermark is hidden into color cover image for different ranges of white Gaussian noise. When hiding color watermark or information in a color image, we get visible watermarked image. The average PSNR and MSE values for their technique was obtained as 67.65 dB and 1059.22, respectively.

III. PROPOSED METHODOLOGY

Embedding Process:



Algorithm: Image Conversion of RGB-GRAY-RGB

Input Images: original image (I), watermark image (W).

Output Image: watermarked image (IW).

Fig 2.1 Original image (I).

Fig 2.2 Watermark image (W).

Steps To Procedure:

1. Get the input images in colour.
2. Covert the RGB image into grey scale image.


Fig 2.3.Host image (grey scale).


Fig 2.4.watermark image (greyscale).


Fig 2.5.watermarked image greyscale.

3. Watermark embedding process is done by pixel mapping technique.

Pixel Mapping Technique (PMT): Embedding positions are selected by some functions and it depends on the pixel intensity value of seed pixels and its neigbours.The process of embedding is done through mapping of each 2 or 4 bits of the secret images in each of the neighbours pixelbased on pixel features. It provide image with good embedding capacity. This method based on four modules such as mapping rules, set classifiers, pixel selection function to hide the watermark image within a host image.

$$IW(i,j)=\alpha I(i,j)+\beta W(i,j)$$

β-Embedding factor(0.01 to 0.25).

i,j-pixel location

From the image I selected set of P pixels, where the watermark is to be embedded, call P a watermarking area. Corresponding set of pixels P in W are denoted by Watermark image is embed in selecting area of host image to get the watermarked image (IW).

4. Ycbcr luminance comparison.

5. Normalization for intensity level.

Y2n = Y2d (:) / (1 - range (Y2d (:)) / 255) * (1 range (Y1d (:)) / 255

6. Built LUT for mapping function and convert RGB image.


Fig 2.6.watermarked image (RGB)


Fig 2.7.watermarked image (RGB)


Fig 2.8.watermarked image (RGB)


Fig 2.9.watermarked image (RGB)

IV. ASSESSMENT CRITERIA

There are some metrics which can be used to check the performance of proposed approach. The commonly used metrics are MSE and PSNR.

α-Scaling factor(0.9 to 0.98).

*Peak Signal to Noise Ratio (PSNR):*It is the measure of quality of the image by comparing the original (host) image with the watermarked image, i.e., it is the measure of the difference between the cover image and watermarked image.

$$PSNR=10 \log 255^2/MSE$$

For a pixel mapping method PSNR value should be high.

V. RESULTS

Host Image: Hibiscus image is used as cover image, of size 256×256. The image is in .jpg format.

Watermark Image: watermark image of size 256×256 used as data to be embed in host image. The image is in .jpg format.

TABLE 1 PSNR VALUES OF PROPOSED APPROACH

Cover image (256*256)	Watermark image (256*256)	(α)	(β)	PSNR	visibility
Hibiscus	Flower (WATERMARK)	0.88	0.10	35.7983	BETTER
Hibiscus (WATERMARK)	Flower	0.88	0.10	33.5947	BETTER
Hibiscus (WATERMARK)	Flower	0.94	0.15	22.0805	GOOD
Hibiscus	Flower (WATERMARK)	0.94	0.15	43.5038	GOOD

TABLE 2 PSNR VALUES OF EXISTING APPROACH IS COMPARED WITH PROPOSED APPROACH

Approach	Ref.1	Ref.2	Ref.3	Ref.4	Ref.5	Ref.6	Proposed approach
PSNR between cover image and watermark image (in dB)	45.34	42.66	60.64	65.70	60.34	67.79	43.5038

VI. CONCLUSION

As per algorithm the elapse time is more. The resultant watermarked image shows dominant color based on input watermark image. Watermarked image colour is based on the chosen image(host, watermark) for converting grey to color.Image quality is tested by the parameter of PSNR.It is based on scaling and embedding factor the PSNR value get change from the table1 whenever the PSNR value high the visibility is high.

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