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New Watermark Algorithm based on two Most Dominant Channel Comparison and Least Dominant Channel Embedding

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Abstract

More information is transmitted in a digital format now than ever. Digital watermarking technology is a method of protecting copyrights for this information. In this paper, new watermarked algorithm is suggested. This algorithm consists of three stages, the first one, image is divided into several blocks, and these blocks are tested to find out the least dominant color channel in these blocks. This channel is used to embed data of watermark. The second stage is comparison process using key and each number in key represent specific bit location exist in one of two most dominant color channel. In case, the bit from the most dominant channel is equal to the bit that extracted from watermark, (zero) will be stored in Least Significant Bit LSB of least dominant color channel. Otherwise, (one) will be stored. The third stage is the key regeneration process. This research gives an excellent result by providing high quality watermarked image, as well as provide high degree of complexity through regeneration process and comparing key with one of two channels and rounding between them.

Keywords:- Least Dominant Channel, New Watermark Algorithm, New Least Significant Bit, Copyright Protection.

1. INTRODUCTION

Because of internet appearance, the necessity of assurance of data authenticity is increased (either image, video or any other type). Watermark is one of the used technique to achieve that purpose. Watermark is really similar to steganography because it contains hidden information in it. But it differs in purpose because watermark are used to give authenticity to sending data but stego are used to send hidden information [1]. Stego Color Cycle (SCC) method describes the pixel indicator technique where one channel is used to locate the channel to store data. This SCC technique uses the RGB images to hide the data in different channels. That is, it keeps cycling the hidden data between these three channels, utilizing one channel at a cycle time.[2] The main problem of this technique is that, hiding the data in these channels is done in a systematic way. So, being able to discover the data in the first few pixels will make the discovery of the technique easy [3]. In this research, the embedding process is depended on the least dominant channel in block. In general, the least dominant channel will be changed in blocks, so, the embedding process will be changed dynamically. As well as, the process of key generation will be changed. So, this method solves systematic hiding problem in channels.

2. Related Work

In (2008), Mohammad Tanvir Parvez and Adnan Abdul-Aziz Gutub proposed the concept of storing variable number of bits in each channel (R, G or B) of pixel based on the actual color values of that pixel: lower color component stores higher number of bits [4].In (2010), Gutub suggests a new technique that takes the advantage of the 24 bits in each pixel in the RGB images using the two least significant bits of one channel to indicate existence of data in the other two channels. This method does not depend on a separate key to take out the key management overhead. Instead, it uses the size of the secret message as selection criteria for the first indicator channel to insert security randomness [5]. In (2010), Tiwari and Shandilya propose two methods of RGB image steganography one is pixel indicator technique and other is triple- A algorithm. The same principles of traditional LSB are used and selection of bits numbers is done randomly and the color channels are used [6]. In (2013), Lip Yee Por, Delina Beh, Tan Fong Ang, and Sim Ying Ong proposed new algorithm namely sequential color cycle. For achieving a higher security, multi-layered steganography can be done by hiding a secret message into multiple layers of cover-images. The performance evaluation establishes that the improvement algorithm can be achieved and the value of the image quality is not falling below the threshold of distortion [7].

3. The proposed Algorithm

The watermark embedding operation is done in the extracted blocks (blocks doesn't have smooth region) and each extracted block is tested to find out the least dominant channel. This channel can be used to embed watermark in that block. the key is rounded between one of the two most dominant channels and uses regeneration process using shift and rotate operation by one ,two …etc.. Because each of the most dominant channel is represented

by a (byte).Each number of that key represents specific bit location in one of the two most dominant channels in block. Fig.1 is the block Diagram that explains how the algorithm is worked.

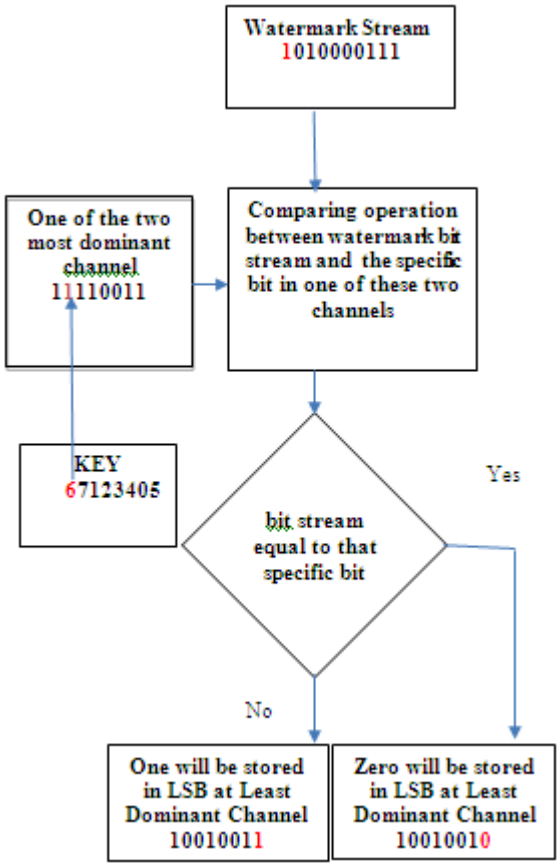


Fig.1:- Block Diagram that explain how algorithm work

Fig.1, fig.2 and fig.3 are examples that explain that Jumping operation is done between the two most dominant channels in a cyclic way (each time the comparison process in one of two most dominant channel and embedding process in least dominant one).

Pixel 1			**Pixel 2**			**Pixel 3**		
R	G	B	R	**G**	B	**R**	G	B
Pixel 4			**Pixel 5**			**Pixel 6**		
R	**G**	B	**R**	G	B	R	**G**	B

Fig.2 Block No.1 Blue is the least dominant channel and the two most dominant channels are Red and Green.

Pixel 1			**Pixel 2**			**Pixel 3**		
R	**G**	B	R	G	**B**	R	**G**	B
Pixel 4			**Pixel 5**			**Pixel 6**		
R	G	**B**	R	**G**	B	R	G	**B**

Fig. 3 Block No2 Red is the least dominant channel and the two most dominant channels Blue and Green.

Pixel 1			**Pixel 2**			**Pixel 3**		
R	G	B	R	G	**B**	**R**	G	B
Pixel 4			**Pixel 5**			**Pixel 6**		
R	G	**B**	**R**	G	B	R	G	**B**

Fig.4 Block No.3 Green is the least dominant channel and the two most dominant channels Red and Blue.

The following algorithm explains these steps in details:-

Step1:-BMP image is divided into several blocks to extract the blocks that don't have loss information.

Step2:-In each block, find the least dominant channel and consider the remaining as the most dominant channel.

Step3:- Generate key that consist from (0…7).

Step4:-Key is used to determine specific bit location in one of two most dominant channels.

Step5:-Hide the data in the least dominant channel.

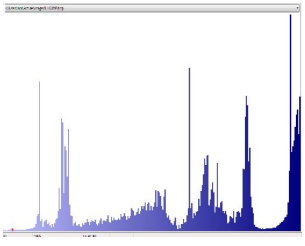
Step6:-After complete the set of the key. Key Regeneration process can be done using shift by two, three ...etc. operation.

Step7:-Repeat steps from two to six until all secret messages complete.

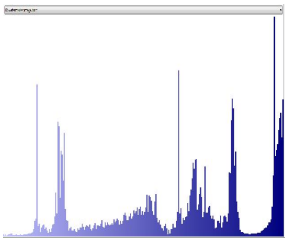
4. Results and Discussion

This algorithm provides the following results:-

Because of the least dominant channel will be changed in blocks, the embedding process will be changed. Therefore, this approach embed watermark in non-sequential fashion solving the least significant bit sequential fashion problem. The watermark is embedded redundantly over all extracted blocks in image to increase watermark robustness. To increase security, embedded bit will not be stored in LSB directly it use comparison techniques to store bits, as well as, this approach will use multiple secret keys. Fig. (5), (6) and (7) explain the histogram of the original and watermarked image which are similar to each other. Peak signal to noise ratio (PSNR) and mean square error (MSE) can be used to measure that quality.

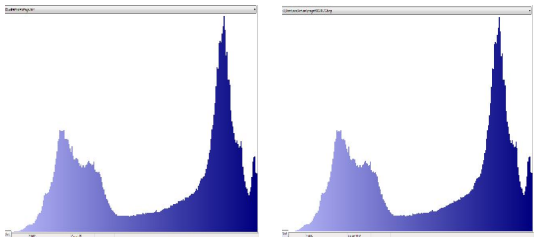


HISTOGRAM OF IMAGE1



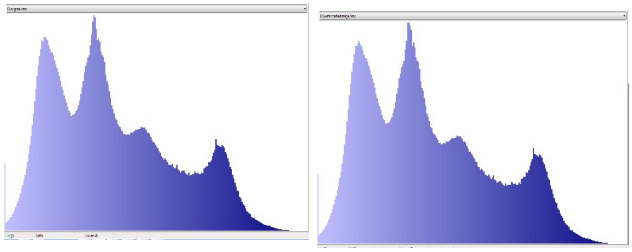
HISTOGRAM OF WATERMARKED IMAGE1

Fig. 5 show that histogram for image1 and watermarked image1 are similar to each other



HISTOGRAM of WATERMARKED of IMAGE2 HISTOGRAM OF IMAGE2

Fig.6 show that histogram for image2 and watermarked image2 are similar to each other



HISTOGRAM OF IMAGE3 HISTOGRAM of WATERMARKED of IMAGE3

Fig.7 shows that histogram for image3 and watermarked image3 are similar to each other

Below is Table1 that gives result of Mean Square Error and Peak Signal to Noise Ratio

Table 1: explains the impact of embedding data on the original image

IMAGE NO.	IMAGE SIZE (KB)	MEAN SQUARE ERROR	PEAK SIGNAL TO NOISE RATIO
IMAGE1	589	0.0020	75.04
IMAGE2	1053	0.00068	79.74
IMAGE3	230400	0.0119	67.34

According to table (1), this algorithm gives high Peak Signal to Noise Ratio (PSNR) and Low Mean Square Error (MSE).

5. Conclusion

It provides perfect result which gives high PSNR and low MSE for watermarked image which mean the similarity between original image and watermarked one are very high. It improve the traditional Least Significant bit approach for the following reasons, first one, because of blocks extraction from cover image and select least dominant channel for each block, so, the problem of sequential embedding in LSB is avoided. Second, embedding process in non-direct way using comparing operation. Third, multiple key is used.

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