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An Efficient Data Embedding Techniques in Image using Levelling of 2-D DWT and Cryptography

Sheshang Degadwala[1], Arpana Mahajan[2], Dhairya Vyas[3], Mouly Purohit[4]

[1]Head of Department, Computer Engineering, Sigma Institute of Engineering, Vadodara, Gujarat, India

[2]Assistant Professor, Computer Engineering, Sigma Institute of Engineering, Vadodara, Gujarat, India

[3]Assistant Professor, EC Engineering, Sigma Institute of Engineering, Vadodara, Gujarat, India

[4]UG Scholar, Computer Engineering, Sigma Institute of Engineering, Vadodara, Gujarat, India

ABSTRACT

The protecting mystery of delicate information turns out to be essential in today computerized correspondence. Steganography is the train of trading top mystery data by installing it into a mixed media bearer and Cryptography is the specialty of securing data by changing it into an imperceptible frame. A definitive point, here is to shroud the very presence of the installed data inside apparently harmless bearers and transmit such that the presence of data is imperceptible. In this paper, proposed technique removes by joining the highlights of cryptography and steganography. Cryptography utilizing Modified ASCII Conversion and Mathematical Function includes changing over the mystery message into unprintable type of same size as unique message in any cases. Steganography is then connected utilizing multilevel 2-D DWT with LSB to install this encoded information into a cover media utilizing High Frequency Coefficients at all levels of 2-D Haar DWT and shrouds its reality. At long last, Performance can be estimated by utilizing measurable parameters PSNR and MSE. This proposed strategy accomplish each of the three parts of information covering up, for example Capacity, Robustness and Security.

Keywords: Haar DWT, LSB, ASCII Conversion, Cyclic Mathematical Function, PSNR, MSE

I. INTRODUCTION

Security of data winds up plainly a standout amongst the most vital components of data innovation and correspondence in light of the gigantic ascent of the World Wide Web and the copyrights laws. Cryptography was begun as a strategy for securing the secrecy of data. Shockingly, it is some of the time insufficient to keep the substance of a message mystery, it might likewise be important to keep the presence of the message mystery and the idea in charge of this is called steganography [2]. Steganography is the act of concealing mystery message inside any media. Most information concealing frameworks exploit human perceptual shortcomings. Steganography is regularly mistaken for cryptography in light of the fact that the two are comparative in the way that they both are utilized to ensure mystery data. In the event that both the strategies: cryptography and steganography is utilized then the correspondence turns out to be twofold secured [2].The fundamental contrast amongst Steganography and cryptography is that, cryptography focuses on keeping the substance of a message mystery while steganography focuses on keeping the presence of a message mystery. ASCII Conversion and cyclic numerical capacity based cryptography is another cryptographic calculation which takes after an alternate approach from the customary symmetric-key cryptography, unbalanced key cryptography or hashing capacity [11].

This paper utilizes Modified idea in view of this cryptography calculation for information encryption, where the information will be changed over into an unprintable frame, which will be then covered up into a picture document. So as to empower vast limit of information and keeping up god visual nature of the cover picture, the installing is connected by changing the slanting points of interest coefficients (High recurrence coefficients) in change space of Multilevel Two-Dimensional Haar Discrete Wavelet Transform (HDWT). Minimum huge piece (LSB) inclusion is a typical and straightforward way to deal with install data in a picture document [4]. In this strategy the LSB of a byte is supplanted with a M‟ s bit. This procedure functions admirably for picture steganography [4]. The upsides of utilizing this framework is that it doesn't require the first cover picture for fruitful extraction of the mystery message.

II. METHODOLOGY

A. Cryptography Approach

It is another cryptographic calculation which takes after an alternate procedure from the conventional symmetric-key cryptography, deviated key cryptography or hashing capacity. It is utilized to make the scrambled message without a doubt unprintable utilizing a few times of ASCII transformations and a cyclic numerical capacity. Separating the first message into parcels. Twofold lattices are framed for every bundle to create the unprintable scrambled message through influencing the ASCII to an incentive for each character underneath 32. So also, a few ASCII transformations and the reverse cyclic numerical capacity are utilized to unscramble the unprintable encoded message. The last scrambled message got from three times of encryption turns into an unprintable content through which the calculation has larger amount of security without expanding the span of information or loosing of any information when size of unique message is distinguishable or not by Packet estimate.

B. Transform Domain Approach

Two dimensional (2-D) Discrete wavelet change (DWT) strategy is a standout amongst the most essential systems in changing a spatial area picture into a recurrence space picture. This sort of two-dimensional DWT prompts a disintegration of estimate coefficients at level j in four parts: the guess at level j+1 and the subtle elements in three introductions (flat, vertical, and corner to corner). HDWT is the least demanding and most ordinarily utilized technique. HDWT can be actualized by two techniques: (1) Horizontal Operation and (2) Vertical Operation. In the first place the Horizontal Operation is used to deteriorate a picture into a low recurrence band (L) and a high recurrence band (H). Second Vertical Operation is used to segment L and H into LL, LH, HL and HH distinctive recurrence groups, each of which has ¼ of the first picture measure. HH speak to High Frequency band, LL is low recurrence band and LH and HL are center recurrence groups. The coefficients in LL are foremost. In the event that any of the coefficients in LL recurrence band are changed, spectator can noticeably observe that the comparing spatial area picture has been changed. Human eyes are not delicate to change of HDWT coefficients in HH. For any reason, when any coefficients in HH are adjusted, an eyewitness can exhaustingly (troublesomely) recognize the adjustment in the spatial area picture. After change, store message bits into HH recurrence coefficients we can utilize LSB technique since it is least difficult and exceptionally well known strategy in spatial space. When utilizing LSB, we needn't bother with unique cover picture for removing mystery message than that are required into different techniques in spatial area, for example, XOR Method.

In multilevel 2-D HDWT, we can apply 2-D HDWT on NXN picture up to k level where k=log2N. For ex, if picture has 256X256 size then we can apply 2-D HDWT on that picture up to k=log2(N)=log2256=8

levels. How about we consider picture has 8X8 pixel estimate then deterioration of this picture utilizing multilevel 2-D HDWT up to 3-levels appeared in Figure 1

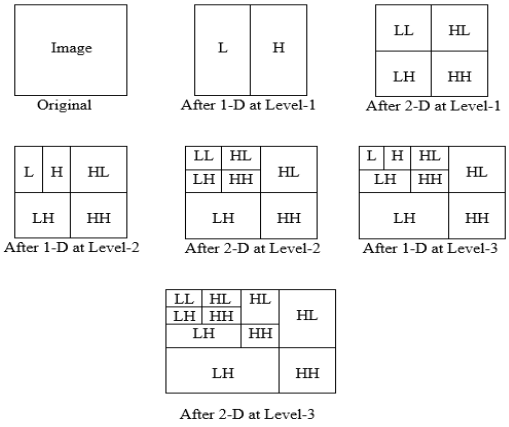

Figure 1. 3- Level 2-D HDWT

III. PROPOSED WORK

A. Embedding Procedure

Input: An n × n color image and a secret message.

Output: An n × n stego-image.

Algorithm:

Steps:

1. Read the Cover RGB Color image.
2. Separate Each Color Components from Cover Image such as R-Color Image, G-Color Image and B-Color Image.
3. Read the secret message.
4. Apply Encryption procedure of Modified ASCII conversion and Cyclic mathematical function based Cryptography to create binary message vector.
5. Find length of Binary Message Vector and calculate maximum level of HDWT by K= $\log_2 n$ levels.
6. If length of binary message vector is greater than zero and current level is less than maximum level (K) then apply 2-D Haar Discrete Wavelet Transform at Next Level on each Image Components of Cover Image otherwise go to step 9.
7. Replace Least Significant Bit (LSB) of high Frequency Coefficients of Each Image Components of cover image by secret message bits from message vector and remove those bits from message vector.
8. After storing message bits in all high frequency coefficients of each image components, again calculate length of binary message vector and go to step 6.
9. Combine all Stego image components such as R-Image, G-Image and B-Image to prepare Stego RGB Color image for display.

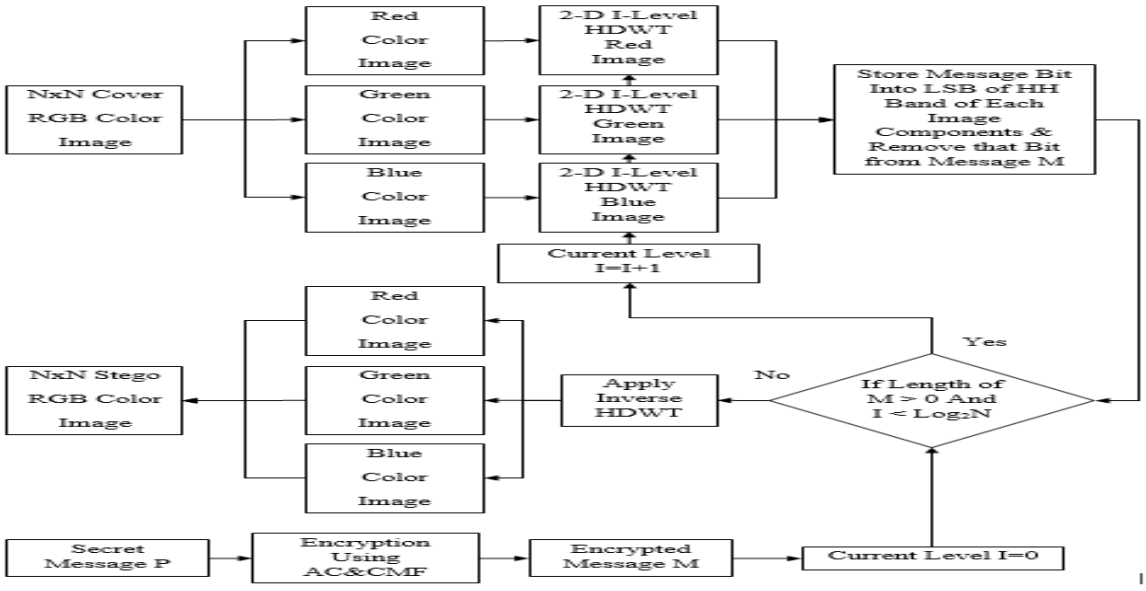

Figure 2. Embedding Procedure

B. Extraction Procedure

Input: An n × n stego Image.

Output: A Secret Message.

Algorithm:

Steps:

1. Read the Stego RGB Color image.
2. Separate Each Color Components from Stego Image such as R-Color Image, G-Color Image and B-Color Image.
3. Read No of Characters to be extracted and Calculate No of Bits to be extracted.
4. If no of bits to be extracted is greater than zero and current level is less than maximum level (K) then apply 2-D Haar Discrete Wavelet Transform at Next Level on each Image Components of Stego Image otherwise go to step 7.
5. Extract Least Significant Bit (LSB) of high Frequency Coefficients of Each Image Components of Stego image and append that secret message bit to message vector.
6. Decrease no of bits to be extracted and go to step 4.
7. Prepare Message Vector.
8. Apply Decryption procedure of Modified ASCII conversion and Cyclic mathematical function based Cryptography to create original secret message for display.
9. Stop.

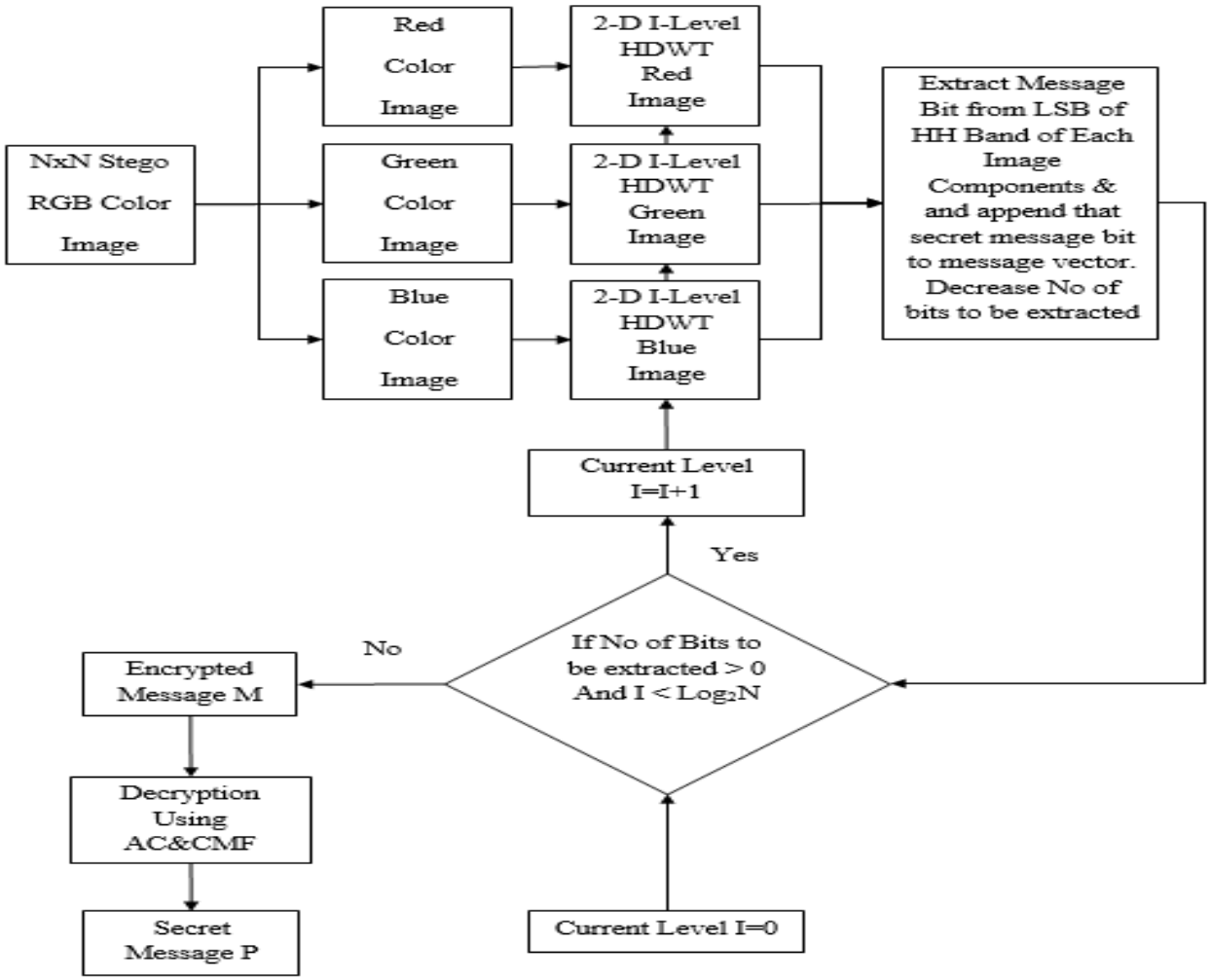

Figure 3. Extracting Procedure

IV. EXPERIMENTAL RESULT

This Section will investigate the performance of the proposed system with experiments. The program coded in Matlab is run on a personal computer whose operating system is Microsoft windows 7 ultimate. The CPU of the personal computer is Intel(R) Core(TM) i5 CPU M 460 @ 2.53 GHz and its RAM is 3 GB. The Images "Lena", "Airplane", "Boat", "Peppers", "Tiffany", "Gold Hill", "Barbara", "Baboon", "St Stephens" and "Light House" are shown below which are used as a cover images.

Lena

Airplane

Boat

Peppers

Tiffany

Gold Hill

Barbara

Baboon

St Stephens

Light House

The Aim of this experiment is to find and Compare MSE and PSNR after applying multilevel 2-D HDWT using LSB and Multilevel 2-D using Alpha Blending with α=0.004 on different size of messages for 256X256 "Lena" image.

Table 1. MSE and PSNR of Proposed Method

Message Size in Bytes	Multilevel 2-D HDWT Using LSB		Multilevel 2-D HDWT using Alpha Blending (α=0.004)	
	MSE (%)	PSNR (db.)	MSE (%)	PSNR (db.)
1 byte	0.000091553	88.5141	0.000091553	88.5141
2 bytes	0.00010681	87.8446	0.00010681	87.8446
5 bytes	0.00033569	82.8714	0.00038147	82.3162
10 bytes	0.00068665	79.7635	0.00073242	79.4832
50 bytes	0.003418	72.7931	0.003479	72.7163
100 bytes	0.0063171	70.1256	0.0071259	69.6024
500 bytes	0.030014	63.3576	0.036072	62.5591
1000 bytes	0.059479	60.3872	0.072464	59.5296
2000 bytes	0.12042	57.3237	0.14548	56.5029
3000 bytes	0.18231	55.5227	0.21829	54.7404
4000 bytes	0.24268	54.2805	0.29227	53.473
5000 bytes	0.30209	53.3294	0.36574	52.4991
6000 bytes	0.36324	52.5289	0.43898	51.7064
7000 bytes	0.50323	51.1131	0.63571	50.0982
8000 bytes	0.78333	49.1914	1.0483	47.9258

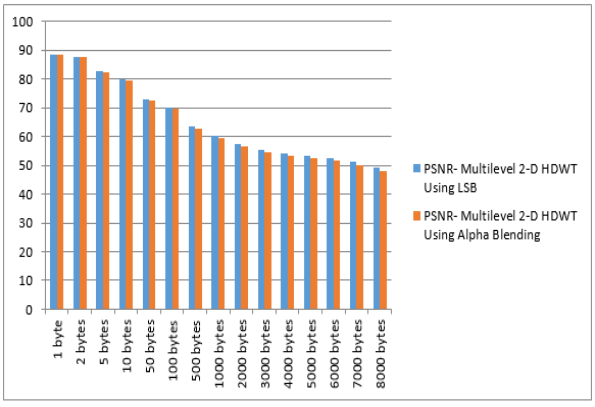

Figure 4. Graphical Representation of Proposed Work

V. CONCLUSIONS

From This Experiment, I conclude that multilevel 2-D HDWT using LSB gives higher PSNR value than that using Alpha Blending. Chart for comparing PSNR of

Multilevel 2-D HDWT Using LSB and Multilevel 2-D HDWT Using Alpha Blending. Hereby it is concluded that Image Steganography Using multilevel 2-D HDWT Transform is more robust and provides more payload capacity. And cryptography based on Modified ASCII conversion and cyclic mathematical function provides high level security without increasing size of encrypted message. The security level of this method can be measured based on the PSNR value. Increase payload, PSNR value must be little decrease. Wavelet takes less time than the curvelet and provide more robustness than discrete cosine transform.

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