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# Embedding Audio Message in Images Using Integer Wavelet Transform-A Detailed Survey

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**Abstract - Data hiding is method where secret data is embedded into an original image in a reversible manner. Usually RDH spatial-domain photographs are encrypted. The reversible data hiding can thought as a data carrier that hide secret information .The proposed system encrypts the JPEG bit stream in to an ordered structure. Then it embeds secret information by adjusting the JPEG BIT stream. The bits for data hiding are then identified. To have an ideal knowledge removal and picture recovery, error correction codes are used in coding the secret data. Encryption and embedding keys are used in encryption and embedding purpose. The message bits are encoded and embedded into the encrypted bit stream by changing the appended bits. Using the encryption and embedding keys, the receiver may remove the data and completely restore the original image. Once embedding key is missing, the initial picture could be more or less recovered with adequate quality without removing the hidden data.**

**Keywords: Data hiding, JPEG bit stream, Embedding.**

## I. INTRODUCTION

Due to the excellent property of data hiding methods in the images, they play an important role in many areas for previous years. Data hiding is the process of hiding messages such as file, images secret data's into another file for security purpose. Without causing any distortion in the cover image, this method can be used in various fields such as medical military and law forensics area.

In data hiding process, it will conceal some secret messages in the original image also known as cover image so that the scepter parties could draw out the concealed messages and also recover the image to its original form. The performance of reversible data-embedding methods can be measured by the following ways such as Payload capacity limit that tells how much amount of data that can be embedded to an image and other is looking mainly on the visual quality of the processed image.

Many data hiding techniques have been proposed in recent years, e.g., the methods based on lossless compression, difference expansion, LSB, histogram shifting (HS) and integer transform etc. The above mentioned methods help to improve the embedding capacity (EC) as high as possible.

The paper later explains about the literature survey in the Section II. The Section III gives the descriptions of the methodology that is being used in encrypting audio message in the image. Finally we conclude the paper.

## II LITERATURE SURVEY

The large numbers of research have been put forward to explaining the methods related to the reversible data hiding scheme. The literature covers wide variety of papers this review manly focussed on paper related to the embedding strategies and later on explains the paper on reversible data hiding.

According to the first phase of the literature survey, based on embedding scenario, the data hiding can be done in two different ways. Method one says about the algorithm that is done in the discrete cosine transform. It is mainly used in image processing, as well as in the field of science and engineering.

Formally, DCT is a linear function F: $R^N \rightarrow R$, where R is a real number. It can be similar to discrete Fourier transforms. The DCT divides the image into different parts or different components; mainly it focused on the image color intensity. It transforms images from the spatial domain into frequency components.

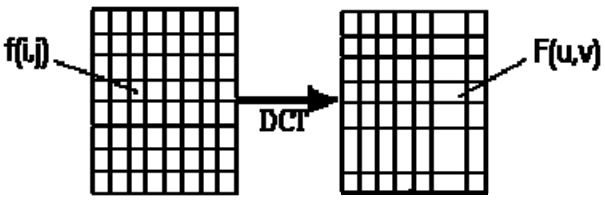



Fig 1: Image Transformation

The general equation for a 1D DCT is defined as:

$$F(u) = \left(\frac{2}{N}\right)^{\frac{1}{2}} \sum_{i=0}^{N-1} \Lambda(i).\cos\left[\frac{\pi.u}{2.N}(2i+1)\right] f(i)$$

Where,

$$\Lambda(i) = \begin{cases} \frac{1}{\sqrt{2}} & \text{for} \xi = 0 \\ 1 & \text{otherwise} \end{cases}$$

Yang et al. [9] states an algorithm that uses the DCT method for the image compression. The capacity to hide the secret information and obtaining the perfect restored image can be done by choosing different numbers of AC coefficient. These coefficients can be selected on different frequencies. Xuan et al. [10], also employed in the same field. But he uses integer wavelet transforms. These transforms allows multi resolution sub band compressing methods and allows decompressing of data and gradually option the original image.

Method second says about lossless compression of the distinctive attributes of an image to obtain sparse area to hide the secret message. Fridrich et al. [7] used a JBIG tool

for compressing. In this he first compresses a bit plane so that minimum redundancy can be obtained. And later uses the hash function. The distorted parts of the image can derive to use hash function the most significant bit plane therefore it causes visual artifacts.

JBIG is a platform independent and support sequential encoding method. It can be implemented easily. JBIG is also known as JBIG1 and new release of JBIG is JBIG2.In sequential encoding, it reads the content of the image that is pixel content from each corner to another part of the image. It attains the compression ratio of 20% to 50%in some cases it also gives a 30 -fold improvement. This compression is mainly performed on Bi level image and on some sort of color and grayscale image as well.

Celiac. et. al [8] tells about a lossless compression algorithm. For that he uses CALIC tool. So it can achieve high capacity using LSB and capacity also depends on image structure that consider for the processing. CALIC stand for "Context Adaptive Lossless Image Compression". It is a quite simple algorithm involves most arithmetic methods and uses simple logic. It puts heavy emphasis on image data modeling and uses less time and space complexity. CALIC mainly focused on finding the prediction errors rather than finding conditional error probabilities.

Moving to second part of literature survey based on the reversible data hiding there are lots of papers available. In [12]. Bhaskara Reddy et .al tells about an effective Algorithm of Encryption and Decryption of Images .It is done using Huffman coding also with the Random Number Generation method. In this paper, they implemented security for image. They select an image, read its pixels and convert it into pixels matrix. Replace that pixels into some fixed numbers generate the key for the encryption using random generation technique .Encrypting the image using this key, and change it into one dimensional encrypted array and at last apply Huffman coding on that sequence , due this size of the encrypted image is reduced .The decryption is reversing process of encryption. Hence the proposed method provides a high security for an image with less memory usage.

Zhang [20] tells about the data hiding scheme. In the first stage the owner encrypts the image which is an uncompressed one into an encrypted format. The encryption is performed using a key what we called as an encryption key. Later on, moving the encrypted image to data hider. The data hider compress the LSB of the encrypted image. The action is performed using another key so that the free space is obtained to embed the data. Since LSB is only affected while incorporating the secret data, decryption of an image using an encrypted key will approximately recover the original image. Then, using the encryption key we can perfectly restore the image that we first used.

## III METHODOLOGY

In proposed paper the original image is taken and read its pixel. Then convert into the matrix format. The intensity of each pixel can be obtained by looking at pixel matrix value. The pixel that has same intensity will have same value .Replace that pixels into some fixed numbers and generate the encryption key using this random generation technique . The image is encrypted using this encryption key. This the first section of proposed system.

After that it is forwarded to the data hider. Data hider is the person that hides the secret audio message. He first checks whether the image is in encrypted formats. For embedding audio data, we use an integer wavelet method. The first audio signal is decomposed to different wavelet bands. From that we obtain an integer value. Take coefficient value and transmitted to adaptive coding method. And embedded into the image using the embedding key. For embedding data the pixel that has same values are allocated first then it is grouped using Huffman coding method and the individual pixel are encoded using to run length encoding. The vacant space is obtained to embed the data. In this space compressed audio message are embedded to it.

The last session is decrypting process. Decryption is the reverse of encryption process .First the audio message are taken from the using embedding key and decoded it, afterwards the original image is recaptured using the encryption key.

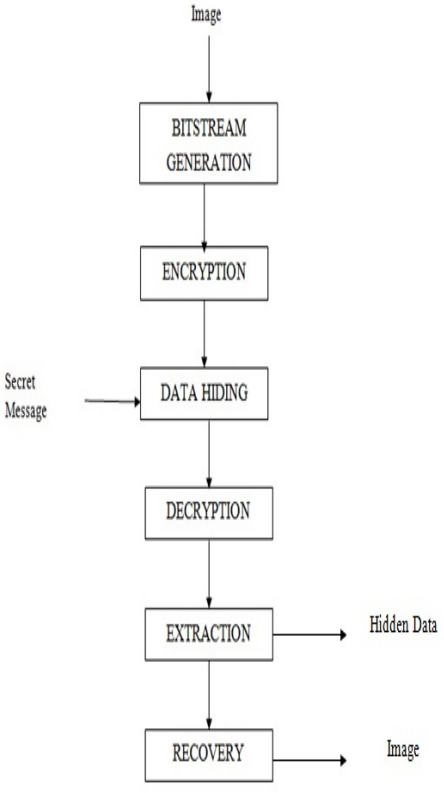



Fig 2: Proposed system flow chart.

A. Brief description of the JPEG BITSREAM parsing

In general, an image is decomposed into quantised coefficient. After that it is coded into bit streams using entropy encoding. Two different coefficients are obtained. They are handled by Huffman coding and run length encoding.Divide the JPEG bit stream into MN/64 segments, each corresponding to an 8*8 block of I.

For the $^{(i,\ j)th}$ block, $1 \leq i \leq M/8$, $1 \leq j \leq N/8$, the encoded bits can be represented by

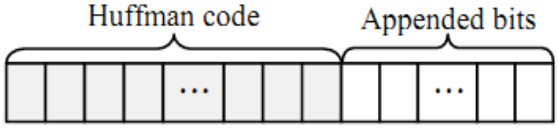
$$S^{(i,j)} = \{[H_0^{(i,j)}, A_0^{(i,j)}], [H_1^{(i,j)}, A_1^{(i,j)}], ..., [H_k^{(i,j)}, A_k^{(i,j)}], ...\}$$

B. Brief description of the bit stream encryption

By this encrypting a JPEG bit stream into the one that can be decoded into an unrecognizable image directly by a JPEG decoder. In the first step, parse the JPEG bit stream, and divide the compressed segments J bits in into MN/64 corresponding to all 8*8 blocks. After that encoding the bits we get can be used as an encryption key. Using that key the image is encrypted.so it will be in unrecognized form. This image is later sent to the data hider for hiding the audio message.

D. .Brief description of the Huffman coding

It is a data compression tool that can be used to compress all types of information. It is an entropy based algorithm that is mainly used for construction of minimum redundancy code. In order to encode an image, it first divides image into 8*8 blocks. And each block is to be coded. Then compute HUFFMAN coded for each block set. That is small codes are assigned to more frequent use symbols and longer codes are given to the symbols which appears less frequently in the block. So find output will be variable length code length.




It is most widely used in grayscale images. It gives about 60% saving in size.

## CONCLUSION

In this paper we mainly focused on Reversible data hiding in encrypted images is a new topic drawing attention because of the privacy preserving requirements from cloud data management. It is mainly focusing on sending audio message in the original image. It makes transmitting the secret information on simpler manner. Also all the experiments are done in the gray scale images. There will be a future scope to extend this work to colour images. And also chances to achieve better peak signal noise ratios.

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## REFERENCE

[1]. J. Fridrich and M. Goljan, "Lossless data embedding for all image formats," *in Proc. SPIE Proc. Photonics West, Electronic Imaging,* Security and Watermarking of Multimedia Contents, San Jose, CA, USA,Jan. 2002, vol. 4675, pp. 572–583

[2] W. Zhang, B. Chen, and N. Yu, "Improving various reversible data hiding schemes via optimal codes for binary covers," *IEEE Trans .Image Process*., vol. 21, no. 6, pp. 2991–3003, Jun. 2012.

[3] Nosrati * Ronak Karimi Mehdi Hariri," Reversible Data Hidin g:Principles, Techniques, and Recent Studies". *World Applied Programming*, Vol (2), Issue (5), May 2012. 349-353ISSN: 2222-2510©2011 WAP journal. www.waprogramming.com

[4] L. Luo et al., "Reversible image watermarking using interpolation technique," *IEEE Trans. Inf. Forensics Security*, vol. 5, no. 1, pp.187–193,Mar. 2010.

[5]. V. Sachnev, H. J. Kim, J. Nam, S. Suresh, and Y.-Q. Shi,"Reversible watermarking algorithm using sorting and prediction,"*IEEE Trans.Circuits Syst. Video Technol*., vol. 19, no. 7, pp. 989–999, Jul. 2009.

[6] S. Lee, C.D. Yoo, T. Kalker "Reversible image watermarking based on integer-to-integer wavelet transform"*IEEE Transactions on Information Forensics and Security,* 2 (3) (2007), pp. 321–330

[7] .J. Fridrich, J. Goljan, R. Du, "Invertible authentication, in" *Proceedings of the SPIE, Security and Watermarking of Multimedia Contents*, vol. 4314, San Jose, CA, January 2001, pp. 197–208.

[8.] M.U. Celik, G. Sharma, A.M. Tekalp, E. Saber ."Lossless generalized-LSB data embedding".*IEEE Transactions on Image Processing,* 14 (2) (2005), pp. 253–266

[9] B. Yang, M. Schmucker, C.B.W. Funk, S. Sun, "Integer DCT-based reversible watermarking for images using compounding technique, in": *Proceedings of the SPIE, Security, Steganography, and Watermarking ofMultimedia Contents,* vol. 5306, San Jose, CA, January 2004, pp. 405–415

[10] G. Xuan, Y.Q. Shi, Q. Yao, Z. Ni, C. Yang, J. Gao, P. Chai. "Lossless data hiding using histogram shifting method based on integer wavelets" .*International Workshop on Digital Watermarking,* Lecture Notes in Computer Science, vol. 4283Springer, Jeju Island, Korea (2006), pp. 323–332

[11] K.Shankar, 2Dr.C.Yaashuwanth" Data Hiding and Retrieval in Encrypted Images". © 2014 IJEDR | Volume 2, Issue 1 | ISSN: 2321-9939

[12]. Dr. T. Bhaskara Reddy, Miss. Hema Suresh Yaragunti , Mr.T. Sri Harish Reddy, Dr. S. Kiran " An Effective Algorithm of Encryptionand Decryption of Images Using Random Number GenerationTechnique and Huffman coding*" Hema Suresh Yaragunti et al, Int.J.Computer Technology &* Applications,Vol 4 (6),883-891

[13] X. Zhang, "Separable reversible data hiding in encrypted image," IEEETrans. Inf. Forensics Security, vol. 7, no. 2, pp. 826–832, Apr.2012.