Reversible Data Hiding Practices: An Exhaustive Study

Deepika Bahal
Dept. of CSE & IT
Madhav Institute of Technology and Science
Gwalior, India
deepikabahal20@gmail.com

Manish Dixit
Dept. of CSE&IT
Madhav Institute of Technology and Science
Gwalior, India
manishdixit@ieee.org

Abstract *:*Aphenomena of hiding any information are known as data hiding. For hiding data a number of techniques are used.Hiding of data can be done withan audio, video,text and image.Inserting data in other data are a way of stenography.Mainly, in a digital image we hide data.It is equally mandatory to provide security with data hiding because data aretransmitted over the network.There are many robust methods for encryption of images as per requirement. This paper provides a detailed survey of various techniques available for RDH.

Keywords*:* Image steganography, Reversible Data Hiding, LSB, Histogram, Region of Interest, SMVQ

I. Introduction

Steganography,which accurately means "coverwriting" and is coined from Greek terms Steganós (Covered), and Graptos (Writing). Usually,invisible communicationis identified as steganography.In different form theirs is hiding of data, such as audio, video, image, communication. As people regularly convey email in which there are mainly digital images or sharing of these images is done through internet communication applications modern.Multimedia objects like images, audio, video,etc.as a cover imagesystem which is used is known as steganography. Amessage which contains actual content protecting is essential. In the modernworld,other information data can be hidden. Steganography deals with the art of a hiding information with an interesting property of hiding the mere existence of the secret information. Cover image,secret image and stego-image is the key modules of stenographic prototype. Wherewe mask our clandestine information is known as a cover image.The bit stream is converted into a secret image which is hidden and itusagesstego-key, the insertion procedure is performed.Forsafe communication withoutcompromising the quality of cover media after mining the message.

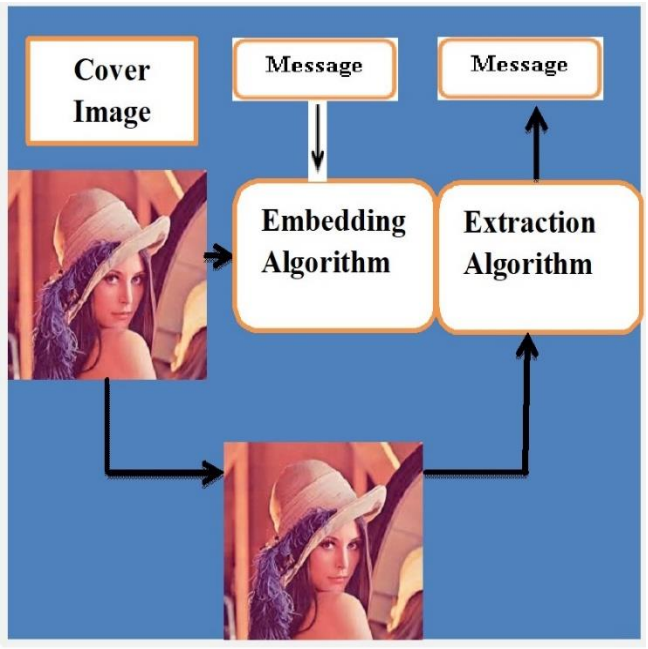

Figure 1: Image Stegnography

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A method "Reversible Data Hiding" is used to conceal covert information. In current time various RDH techniques have developed like histogram modification and the difference expansion technique. Being lossless makes this technique suitable for medical and military applications. This technique received more attention over the years because of its high efficiency and simplicity.

II. Related Work

This paper is based on the recent innovation made in the field of data embedding and using image steganography.

Weiming Zhang et.al [1] have used a novel framework which is createdfor reversible image transformation (RIT) for RDH.The semantics of the previousimage to the semantics of other imageare through RDH-EI and original image is protected.The original image can be converted to arandomly selected target image of the same size bymeans of RIT and the original image can be restoredfrom the encrypted image in a lossless mode.

Pulkit Khandelwal and Neha Bisht [2] have used dynamic programming to estimate the cost of the image and further random traversal is used to choose the pixels in which data is to be inserted. The authors have embedded each of the selected pixels in a predefined manner where information is in the form of bits. In terms of payload capacity, robustness, fidelity and the metrics calculated show a remarkable improvement over these existing methods.

Zhenxing Qian et.al [3] have used a method which is grounded on progressive recovery of reversible data hiding in encrypted images (RDH-EI). There existsa framework in which three parties are included they are content-owner, the data-hider.Encryption of an original image by means of a stream cipher process. The encrypted image into three channels to create a marked encrypted image and extra data which is mined from the marked encrypted image and the original image can be retrieved which does not include any fault on the recipient side this entire procedure is completed on server side by data hider. Itverifies that it is better than a separable RDH-EI method to accomplish animproved embedding rate.

Vaishali Sharma and Rupali Bhardwaj in [4] have implemented a method in which complemented message is secretedby creating an outline of the cover image, by means of the inverted bit LSB technique. Where simulation is completed in MATLAB 14 they have used predictable on the basis of PSNR and MSE. As the cover image to cover images ofdimension 512 X 512 is used which is agroup of 8-bit grayscale and the gray image of size 128 X 128 to develop the stego image. Instead of hiding the message bits absolutely in cover image pixels the three levels of security, are generated randomly by authors provided through the pseudo-random number generator.

Zhenxing Qian and Xinpeng Xhang in [5] have exhausted distributed source coding aninnovative scheme for data concealmentof reversible data hiding (RDH). The new image is scrambled with a stream cipher by the sender. The original image is retrievedof greatquality and with the embedding key all the hidden data can be extracted. To enhanced embedding payload in the encrypted image recommended method adds to the VRE category.

Tajo Mathew in [6] has employed the approach of reserving a sufficient area for the added data before encrypting the cover image. Firstly, it classifies the suitable blocks of hiding data from various parts of the image. After encrypting the image, those LSB-planes are used to hide additional data. It accomplishes the state-of-the-art methods in the encrypted imagein the projected scheme experimentally.

Ying –Hui XIA and Hao –Tian WU [7] have recommended a method to distinctthe background and foreground the basic grayscale values which is identified as the utmost inter-class square error so that segmented background can berecognizable. Anoveltechnique is used to acquire the foreground contour in order to raise the contrast of ROI in the medical image. There are three approachesused by authorsfor data hiding, i.e. Background segmentation, pre-processing and data embedding. By using themethods, the original image can be retrieved whenever required.

Dongdong Hou et.al [8] have firstly processed the original image by means of a classic image processing methodto develop the desired target image.According to the transition probability matrix the original image can be processed. The Author has used reversible image processing (RIP) technique. To accomplish the original image author used the two methods histogram equalization and gamma transform. The original copy of the processed image without loss can be returnedby thesemethods. Similar histograms of the original

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and processed image can be obtained by using these two techniques.

Zhuo Zhang and Weiming Zhang [9] have utilized used reversibility and moderate detectability methods to hide data. Created on histogram shifting methodfor prediction error (PE) the authors have offered a reversible steganographic method. Data hiding methodsrequire multimedia-based covert storage. The concept of "Reversible steganography" came to meet the covert storage needs.This is aninstance of which has reversed and moderate undetectability.

Tanwi Biswas et.al [10] have recommended aninnovativetechniquethat is created by compressed gray level histogram shiftingof reversible data hiding which offer an extremeability of data hiding and also preserve high-qualityimage. For achieving lower distortion and improved capacity authors have used a histogram shifting created by data hiding technique.

Hamad A AL-Korbi et.al [11] have used Haar Wavelet transform to offer a great capability and effective stenography method so that in a sole cover at the same time binary image, color images, and large text files can be all hidden.The user can conceal multiple types of private data (i.e. B&W and color images and text files) with a stego-image of a unified size of 512 X 512 pixels.By make use of recommended procedure,along with low mean square error(MSE) and high power signal-to-noise ratio (PSNR), a high capacity of about 99% is beingaccomplished.

Lingfei Wang et.al [12] offered a unique method reversible data hiding scheme which utilizesenhancedSide –match vector quantization (SMVQ) for color images.In SMVQ method authors done the first column and row blocks are encrypted by convectional vector quantization and the residual blocks are encoded in a raster scanning order. Using a smaller sub codebook (SC). SMVQ technique can be simply designed by designing shifting and embedding functions. Embedding capacity and image quality can be enhanced.

Panda et.al [13] presented a secure method to cover image in image steganography, by altering within the neighboring pixels the cover image.This technique makes the image more steady and unchanging.

Khodaei et.al [14] presented a method by means of pixel value differencing and LSB substitution for data hiding. Here an image is fragmented into two blocks. The difference of two pixels is calculated and as per the difference,the number of embedding bits into LSBs of two pixels will bepredictable.

Zhicheng Ni et.al [15] offered a technique that explains reversible separate original image from the data which is hidden removed without any loss . By utilizing a data hiding key, add data to the scrambled image which is encodedby means of encryption keys. Extraction of themessage is only done by the person who use up the data hiding key, without havingknowledge of the original image. Extraction of the novel and hidden data is possible if both the keys are known.There is no loss of original image is done with embedded data and it is recovered by any distortion. For this the author used the method which is known as histogram of an image to locate its apex and zero positions and data is embedded by vaguely changetransformation of values.

Xinpeng Zhang et.al [16] proposed a technique in which encryption key is used by the sender toencrypt an uncompressed image.Data administrator will hide the data of the encoded image by utilizing of an encryption key.But previously by compressing Least Significant Bits of encrypted image by consuming another key an encoded image can be compressed. This makes gap for data embedding. Decryption is done by the hider but not the original image. At the recipient-end, original image is obtained without any distortion. This method provides the advantage of lossless compression of data.

Gupta et.al [17] put forward a new method for image security,combining cryptography, stenography and watermarking techniques. It provides improved outcomes for MSE, PSNR and embedding power even after noise attacks and also hides the information. It also offers security for video.

Bajwa et.al [18] implemented two methods for color image steganography. A hashing approach for secure data hiding is proceeded by the authors. Using gray scale a secure image is transmitted at high speed. This technique also supports a data of different file format such as BMP, JPEG,GIF with secured transmission.

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Vipul Sharma and Sunny Kumar [19] suggested a novel method which increases the capacity of storage by concealing message in an image. Compression of data which to be embedded is done by a compression algorithm.Only for bmp images,this technique is helpful.

Yang et.al[20] offered a method for data hiding in the imageby using adaptive LSB substitution. This method takes care of noise sensitive area for embedding,in order to achieve better visual quality of stego-image.Normal texture and edges area of embedding is taken as an advantages. To calculate the number of k-bit LSB, this technique examines the edges, brightness and texture masking of the cover image for secret data embedding. For superior stego-image visual quality done by an LSB substitution method,that is pixel adjustment method is also utilized. This whole effect displays an extreme concealed capability.

III. Table: Comparion Between Related Works

Reference	**Method**	**PSNR(db)**	**Complexity**	**Domain**
Zhenxing Qian [3]	RDH	Not Mentioned	Not Mentioned	Spatial
VaishaliSharma et. al[4]	LSB	59.72	More	Spatial
Zhening Qian [5]	RDH	63.1	Not Mentioned	Spatial
Tojo Mathew [6]	Histogram	55.43	Not Mentioned	Spatial
Ying-Hui XIA et.al[7]	Histogram	35.16	Low	Spatial
Dongdong Hou et.al[8]	Histogram	56.98	More	Spatial

IV. Conclusion and Future Work

The scope encoded this paper the chiefly emphasisat concise explanation of the numerous methods used in reversible data hiding and associationamong them.Ahuge amount of data can be embedded by certain methods, whereas some other embed smallquantity of data. Misrepresentation of the original imageand embedded image, take place in some methods.Due to distortion they havea very bad effect on image and data.But each work has its positive and negative. Different levels of application are completed with separate methods. To provide better security and efficient work it is necessary to develop a robust system and regaining the original data without lacking several alterations. Aninclusivegroupingof image which contain data encryption with security of huge extremehas to be recommended in upcomingeffort.

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Author's Biography

Deepika Bahal received her Bachelor of Engineering in Information Technology from I.T.M Universe,Gwalior in 2015.She is currently pursuing Master of Technology in Cyber Security from M.I.T.S ,Gwalior. Her main research work focuses on Image Processing.She is member of IEEE.

Manish Dixit received his B.E. in Computer Technology from Barkatullah University,Bhopal,M.E in Communication Controland Networking from M.I.T.S,Gwalior and P.hd.from R.G.T.U, Bhopal. He is currently working as an Associate Professor in the Department of Computer Science and Information Technology, MITS, Gwalior,India. He has presented more than 75 research papers in National and International Conferences and Journals .He is a fellow Member of IETE, senior member of IEEE and secretary IEEE MP Subsection. He is member of IET, IAENG andCSI.

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