International Journal for Innovative Engineering and Management Research

PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL

www.ijiemr.org

COPY RIGHT

ELSEVIER
SSRN

IJIEMR Transactions, online available on 31st Mar 2023. Link :http://www.ijiemr.org/downloads.php?vol=Volume-12&issue=Issue 03

10.48047/IJIEMR/V12/ISSUE 03/65

Title **REVERSIBLE IMAGE HIDING USING HISTOGRAM SHIFTING**

Volume 12, ISSUE 03, Pages: 476-480

Paper Authors

G.N.SandhyaDevi, K. Sri Lakshmi, K. Mounika, K. Ganesh, K. Annapurneswara Rao

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

Reversible Image Hiding Using Histogram Shifting

G.N.SandhyaDevi[1],Assistant Professor, Department of ECE, SRGEC, Gudlavalleru, India.
K. Sri Lakshmi[2], Student, Department of ECE, SRGEC, Gudlavalleru, India.

K. Mounika[3], Student, Department of ECE, SRGEC, Gudlavalleru, India.

K. Ganesh[4], Student, Department of ECE, SRGEC, Gudlavalleru, India.

K. Annapurneswara Rao[5], Student, Department of ECE, SRGEC, Gudlavalleru, India.

[1]**Corresponding author E-mail: sandhya031@gmail.com

Abstract— In order to protect the details of any image, the histogram shifting method is used. The image taken for this purpose mainly involves the medical images. Here an image of size 256x256 is taken as input and then encrypted. When the image is encrypted, the details of the image are hidden. After encryption, the image will not be visible to the other person at the receiving end. Now this encrypted image is sent to the end user, so that the process of decryption is done at that end. This process of decryption involves the recovery of the original image without any loss and when appropriate, medical professionals can use the photos containing data to guide proper therapy by using the resultant output, which should be just like the original version. This paper aims at preserving the details of the image by hiding its details. The results of the histogram shifting method are evaluated in terms of Entropy, PSNR and the elapsed time.

Keywords— Histogram Shifting, Encryption and Decryption.

I.INTRODUCTION

A method called "reversible data hiding" makes it possible for data to be hidden within an image while permitting data loss-free reconstruction of the original image. This technique has become increasingly popular due to its applications in the fields of data security, copyright protection, image hiding, information hiding, digital watermarking.

Data hiding with reversibility for compressed images is a research project aimed at developing techniques for hiding data within compressed images in a way that can be undone. Data is added to a cover image through the procedure of reversible data concealing so that the original image can be fully recovered without any information being lost.

The main challenge in reversible data hiding for compressed images is to send the image without causing any distortion or loss of information in the compressed image. This project focuses on developing efficient algorithms for data encryption and decryption that work with popular image compression standards such as JPG.

The objective of reversible data concealment for compressed images is to provide a secure and efficient method for storing and transmitting data, where it is possible to entirely back up the original picture without sacrificing quality and the embedded data can be extracted and decoded without any errors.

Compressed images are widely used due to their small size and ability to be easily transmitted over the internet, but they also present a challenge for data hiding as they contain less redundancy than uncompressed images.

The project will involve the development and implementation of a reversible data hiding algorithm that can operate on compressed images, as well as the integration of encryption techniques to ensure data security. The system will be evaluated using various metrics such as PSNR, image quality in terms of Entropy and

-
-

computational complexity in terms of Time constraint.

There are five sections to this paper. Introduction is included in Section 1. A study of the literature is found in Section 2. Methodology is in Section 3. The conclusions can be found in Section 4. Summaries and conclusions are incorporated in Section 5.

II. LITERATURE SURVEY

This section consists of existing literature related to Histogram shifting.

In 2015, Xialong Li proposed a novel PEE-based RDH technique for many histograms and found that the mistake is to be less in transferring the image [1]. In 2014, K.Hazarathaiah proposed a decompression algorithm for the purpose of encryption and prove that the entropy is good for the proposed method. That is the data is not lost. [2]. In 2014,Lincy proposed pixel distribution to obtain high concealing capacity. Also to be able, to avoid the same image transferred many times, a binary structure is used. This has improved the image quality[3].

In 2019, Qichao Ying proposed the baseline embedding in order to preserve the image as well as maximize the entropy. In this method the baseline component and side information in the extensive embedding are deducted from the entire amount of the extra data and to determine our pure payload [4]. In 2022, ryota M presented a perceptual encryption technique to create compressible encrypted images. The technique has a high degree of concealing capacity, marked-image quality, and lossless compression efficiency. [5]. In 2016, Yanli Chen proposed a video MHS (Multiple histogram shifting)scheme based on compressing sensing (CS). As a result, the majority of test videos' quality higher than those in the most advanced plans in our scheme[6].

In 2016, Fangjun suggested a fresh RDH with histogram shifting approach when it comes to JPEG photos, only coefficients with values 1 and -1 are extended to send message bits, leaving the zero coefficients unaltered. the accomplishment of good visual quality and high embedding capability. Moreover, it is possible to maintain the host JPEG file's storage size[7]. In 2016, Shun Zhang proposed a block truncation coding-based reversible data concealing method applied to the quantized coefficients of compressed images (BTC). Lower distortion and increased embedding capacity have both been accomplished. [8].

In 2014, Chun-Chi Lo, a novel reversible data-hiding technique strategy relating to block truncation coding compressed pictures (BTC). This method offers an embedded image with good image quality[9]. In 2014, Sumija.C proposed the algorithm used for encryption is chaos. It has achieved real Reversibility and independent data extraction with much improved marked decrypted image quality [10]. In 2013, Binita Roshini M proposed medical image privacy security using reversible data masking based on histogram shifting. When appropriate, medical professionals can use the photos with hidden data to help with proper treatment because the output image is identical to its original counterpart[11].

III. METHODOLOGY

Histogram shifting is a way of changing the image's pixel values histogram in order to change the overall contrast or brightness of the image[1]. This technique is often used in image processing to enhance the quality of digital images. In histogram shifting, value distribution across pixels in the histogram is altered by performing a mathematical operation of each pixel value in the image.. The most common form of histogram shifting is called "brightness adjustment," which involves adding or subtracting a constant value from each pixel in the image.

The background of histogram shifting can be attributed to the early days of image processing and computer vision, when researchers were developing techniques to analyze and manipulate digital images[2]. One of the first applications of histogram shifting was in the field of remote sensing, where scientists used it to enhance the contrast of satellite images of the earth's surface.

In the 1980s and 1990s, researchers began exploring the use of histogram shifting in medical imaging, particularly in the analysis of X-ray images Histogram shifting was found to be a useful tool for enhancing the contrast of medical images, allowing doctors and radiologists to more easily identify abnormalities and make more accurate diagnoses.

In the decades since, histogram shifting has become a common technique in a wide range of fields, from astronomy to materials science to biomedicine. It is used to improve the visibility

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

of images captured via a variety of imaging techniques, including X-ray, CT, MRI, ultrasound, and optical microscopy. For example, if we want to increase the brightness of an image, we can shift to the right-hand histogram by simply adding each pixel's value by a consistent amount. Conversely, if we want to decrease the brightness, we can shift the histogram to the left by deducting a consistent amount from each pixel's value. Histogram shifting can be employed to adjust the contrast of an image by stretching or compressing the pixel value range in the histogram[4]. This can be achieved by scaling the pixel values using a function such as power function. Overall, histogram shifting is a useful technique for adjusting the brightness and contrast of digital images and can be used in a variety of range of applications, such as medical imaging, computer vision, and photography.

Using histogram shifting for reversible data concealing, PSNR (Peak Signal-to-Noise Ratio) and entropy are useful metrics to evaluate the quality of the embedded data and the degree of data hiding achieved by the algorithms is a measure of the proportion between a signal's greatest possible value and its noise level. In reversible data concealment, the distortion brought on by the embedding process can be measured using PSNR., i.e., how much the original image has been altered by the embedding process. The higher the PSNR, the less distortion is present in the image, indicating a higher quality of the embedded data.

Entropy, on the other hand, is a measure of the randomness or unpredictability of the information content of a signal. In reversible concealing of data, entropy can be used to measure the degree of concealing of data achieved by the algorithm. If the entropy of the image before and after embedding is the same, then the algorithm has achieved a high degree of data hiding. This means that the embedding process has not significantly altered the statistical properties of the image, and the The original image can be perfectly recreated when the imbedded data has been extracted.

Therefore, PSNR and entropy are useful metrics to evaluate the effectiveness of the reversible data hiding algorithm and to ensure that the embedded data is of high quality while achieving a high degree of data hiding.

Today, histogram shifting is widely used in digital image processing software, such as Adobe Photoshop, to adjust the brightness and contrast of images. It is also a fundamental technique in computer vision where it is used for image segmentation, object detection, and other applications.

Figure 1 demonstrates the steps taken in encryption of the given input image. Figure 2 shows demonstrates the steps taken in decryption of the image.

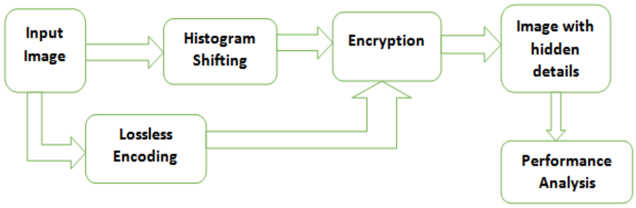

Fig.1. Encryption of the given input image

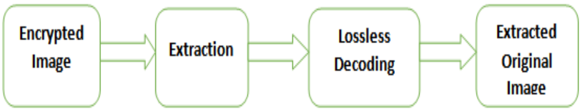

Fig.2: Decryption of the given image

IV. RESULTS

Figure 3 shows the encrypted and decrypted image of the given input image. Figure 4 and 5 shows the histogram of the encoded image and decoded image respectively. The PSNR, elapsed time, entropy output parameters for a given image using histogram shifting are listed in Table 1.

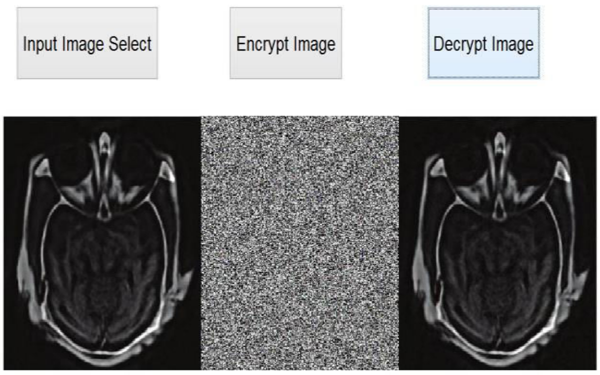

Fig.3: Encrypted and Decrypted image of the input image.

Table 1: Output parameters for a given image

S.no	Image	Elapsed Time	PSNR	Entropy
1	Image 1	0.007886 sec.	7.9988	5.7521
2	Image 2	0.002603 sec	7.9963	6.8193
3	Image 3	0.003669 sec	7.9981	5.5269
4	Image 4	0.001148 sec	7.9908	6.7225

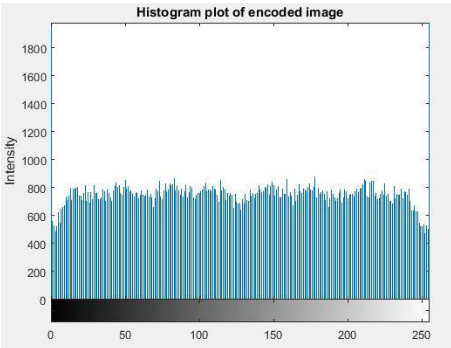

Fig.4: Histogram plot of the encoded image.

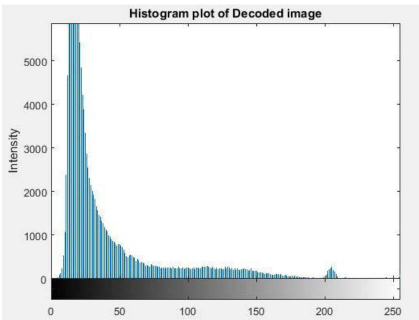

Fig.5: Histogram plot of the decoded image

V. SUMMARY AND CONCLUSIONS

The project "Reversible Data Hiding for Compressed Images" aims to develop a system that can hide secret data within a compressed image in a reversible manner, without causing any visible distortion. The system will also incorporate encryption techniques to ensure data security.

The project involves the development and implementation of a reversible data hiding algorithm that can operate on compressed images, as well as the evaluation of the system using various metrics such as image quality, data capacity, and computational complexity.

The system has significant potential for applications in multimedia security, copyright protection, and digital forensics. The project addresses the challenge of developing a technique that can hide data within compressed images without causing any visible distortion, which is an important problem in the field of data security.

References :

[1] Xiaolong Li, Weiming Zhang, XinluGui, and Bin Yang, "Efficient Reversible Data Hiding Based on Multiple Histograms Modification", IEEE Transactions On Information Forensics ans Security, September 2015.

[2] K. HAZARATHAIAH and VAMSEE MOHAN," Reversible Data Hiding using Histogram Shifting Technique", International Journal of Computer Science and Mobile Computing,, June 2014.

[3] Lincy Rachel Mathews and Arathy C. Haran V, "Histogram Shifting Based Reversible Data Hiding",International Journal of Engineering Trends and Technology (IJETT), April 2014.

[4] QICHAO YING, ZHENXING QIAN, XINPENG ZHANG and DENGPAN YE, "Reversible Data Hiding With ImageEnhancement Using Histogram Shifting", IEEE Access, April 2019.

[5] RyotaMotomura, Shoko Imaizumi , and Hitoshi Kiya, "A Reversible Data-Hiding Method with Prediction-Error Expansion in Compressible Encrypted Images", Applied Sciences, September 2022.

[6] YANLI CHEN, LIMENGNAN ZHOU, YONGHUI ZHOU , YI CHEN ,SHENGBO HU and ZHICHENG DONG, "Multiple Histogram Shifting-based Video Data Hiding using Compression Sensing",IEEE Access, 2016.

[7] Fangjun Huang, Xiaochao Qu, HyoungJoongKim, andJiwu Huang, " Reversible Data Hiding in JPEG Images", IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY,September 2016.

[8] Shun Zhang, Tiegang Gao, Liang Yang, "A Reversible Data Hiding Scheme Based on Histogram Modification in Integer DWT Domain

for BTC Compressed Images" ,International Journal of Network Security,July 2016.
[9] Chun-Chi Lo, Yu-Chen Hu, Wu-Lin Chen and Chang-Ming Wu, "Reversible Data Hiding Scheme for BTC-compressed Images Based on Histogram Shifting", International Journal of Security and Its Applications, 2014..
[10] Sumija.C , A.Thillipan , ManasyMariet and Thomas, S.Rajesh, "Privacy Protection of Medical Data using Histogram Shifting based Reversible Data Hiding", International Journal of Advance Research in Computer Science and Management Studies, April 2014.
[11] BINITA ROSHNI M, RAJA S and VARATHARAJ M, "Privacy Protection of Medical Datas Using Histogram Shifting Based Reversible Data Hiding", International Journal Of Industrial Electronics,Control& Robotics, July 2013.
[12] T. Kalker and F. M. J. Willems, "Capacity bounds and constructions for reversible data hiding," Security Watermarking Multimedia Content vol. 5020, pp. 604–611, Jun. 2003.
[13] M. U. Celik, G. Sharma, A. M. Tekalp, and E. Saber, "Lossless generalized-LSB data embedding," IEEE Trans. Image Process., vol. 14,no. 2, pp. 253–266, Feb. 2005.
[14] J. Tian, "Reversible data embedding using a difference expansion," IEEE Trans. Circuits Syst. Video Technol., vol. 13, no. 8, pp. 890–896, Aug. 2003.
[15] L. Kamstra and H. J. A. M. Heijmans, "Reversible data embedding into images using wavelet techniques and sorting," IEEE Trans. Image Process., vol. 14, no. 12, pp. 2082–2090, Dec. 2005.
[16]D. M. Thodi and J. J. Rodriguez, "Expansion embedding techniques For reversible watermarking," IEEE Trans. Image Process., vol. 16, no. 3,pp. 721–730, Mar. 2007.