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Reversible Image Data Hiding With Contrast Enhancement

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Abstract: **Reversible data hiding (RDH) continues to be intensively studied locally of signal processing. To judge the performance of the RDH formula, hiding rate and marked picture quality are essential metrics. There exists a trade-off together because growing the hiding rate frequently causes more distortion in image content. To measure the distortion, the peak signal-to-noise ratio (PSNR) value ofthemarked image is frequently calculated. The greatest two bins within the histogram are selected for data embedding to ensure that histogram equalization could be carried out by repeating the procedure. Alongside it details are to be embedded combined with the message bits into the host image so the original image is totally recoverable. The suggested formula was developed on two teams of images to demonstrate its efficiency. Within this letter, a manuscript reversible data hiding (RDH) algorithmic suggested for digital images. Rather than attempting to keep the PSNR value high, the suggested formula improves the contrast of the image to enhance its visual quality. To the best understanding, it's the first algorithm that accomplishes image contrast enhancement with data hiding. In addition, the evaluation results reveal that the visual quality could be preserved after a great deal of message bits happen to be embedded into the contrast-enhanced images, better still than three specific MATLAB functions employed for image contrast enhancement.**

Keywords:- **Contrast Enhancement; Histogram Modification; Location Map; Reversible Data Hiding; Visual Quality;**

I. INTRODUCTION

Also known as invertible or lossless data hiding, RDH is to embed a bit of information right into a host signal to generate the marked one, that the initial signal could be exactly recovered after removing the embedded data. Reversible data hiding (RDH) continues to be intensively studied locally of signal processing. The process ford is helpful in certain sensitive programs where no permanent change is permitted around the host signal. Within the literature, most from the suggested calculations are suitable for digital images to embed invisible data [1].To judge the performance of the RDH formula, the hiding rate and also the marked picture quality are essential metrics. There exists a trade-off together because growing the hiding rate frequently causes more distortion in image content. To measure the distortion, the height signal-to-noise ratio (PSNR) value of the marked image is frequently calculated. In most cases, direct modification of image histogram provides less embedding capacity. In comparison, the greater recent calculations manipulate the greater centrally distributed conjecture errors by exploiting the correlations between neighboring pixels so that less distortion is because data hiding. Even though the PSNR of the marked image produced having a prediction error based formula is stored high, the visual quality can hardly be enhanced because pretty much distortion continues to be introduced by the embedding procedures. For that images acquired with poor illumination, enhancing the visual quality is much more important than maintaining your PSNR value high. Furthermore, contrast enhancement of medical or satellite images are preferred to show the particulars for visual inspection. Even though the PSNR value of the enhanced image is frequently low, the visibility of image details has been enhanced. To the best understanding, there's no existing RDH formula that performs the job of contrast enhancement regarding enhance the visual quality of host images. So in this study, we goal at inventing a brand new RDH formula to achieve the property of contrast enhancement rather than just keeping theism value high. In principle, image contrast enhancement could be accomplished by histogram equalization[2]. To do data embedding and contrast enhancement simultaneously, the suggested algorithmic carried out by modifying the histogram of pixel values. First of all, the 2 peaks (i.e. the greatest two bins) within the histogram are found out. The bins between your peaks are unchanged while the outer bins are moved outward to ensure that each one of the two peaks can be split up into two adjacent bins [4]. To improve the embedding capacity, the greatest two bins in the modified histogram could be further chosen to become split, and so forth until acceptable contrast enhancement effect is accomplished.

II. PRE-PROCESS FOR COMPLETE RECOVERY

To prevent the overflows and under-flows because of histogram modification, the bounding pixel values are pre-processed along with a location map is produced to memorize their locations. For that recovery from the original image, the location map is embedded in to the host image, along with the message bits along with other side information. So blind data extraction and complete recovery from the original image are generally enabled. The suggested formula was put on two groups of images to demonstrate its efficiency. To the best understanding, it is the first formula that accomplishes image contrast enhancement bird [3]. In addition, the evaluation results reveal that the visual quality could be maintained after a great deal of message bits happen to be embedded in to the contrast-enhanced images, better still than three specific MATLAB functions used for image contrast enhancement [5].

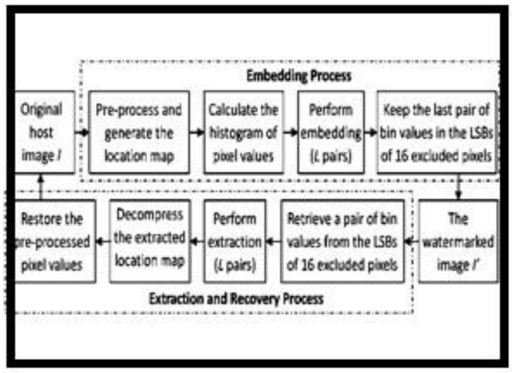
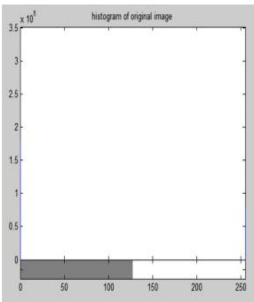


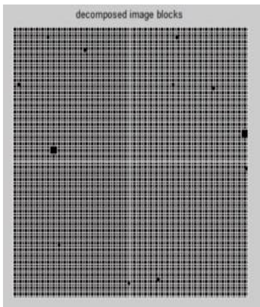
Fig.1. Proposed system structure

III. EXPERIMENTAL RESULTS

In the experimental results the original images with the size of 512x512 were employed and converted into gray level images. Basically, the two peaks in the histogram are selected for data embedding so that histogram equalization can be simultaneously performed by repeating the process. Then the image contrast can be enhanced by splitting a number of histogram peaks pair by pair.



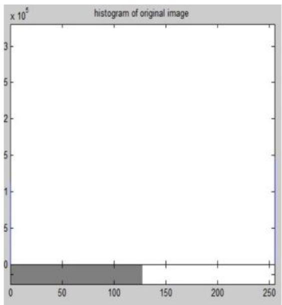
(a) (b)



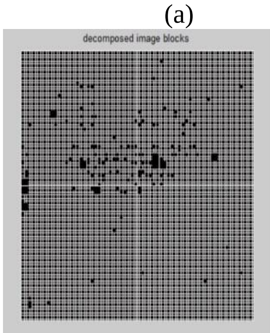
(c) (d)

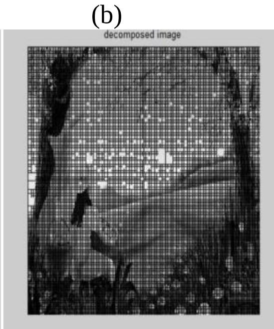
(e)

Fig.2. (a). Original "Lena" image (b). Histogram of original image (c).Decomposed image blocks (d). decomposed image (e). Contrast enhanced image



(a) (b)





(c) (d)

(e)

Fig.3. (a). Original test image (b). Histogram of original image (c). Decomposed image blocks (d). decomposed image (e). Contrast enhanced image

Although the PSNR value of the contrast-enhanced images decrease with the data hiding rate, the visual quality has been preserved. Moreover, the original image can be exactly recovered without any additional information. Hence the proposed algorithm has made the image contrast enhancement reversible.

IV. CONCLUSION

Essentially, the 2 peaks (i.e. the best two bins) within the histogram are selected for data embedding to make certain that histogram equalization can be concurrently moved out by repeating the procedure. The experimental results have proven the appearance contrast can be enhanced by splitting numerous histogram peaks pair by pair. In comparison while using the special MATLAB functions, the visual company's contrast-enhanced images produced by our formula is more preferable maintained. During this letter, a totally new reversible data hiding formula has been proposed while using the property of contrast enhancement. Additionally, the very first image can be exactly retrieved with no more particulars. Consequently the suggested formula helps to make the look contrast enhancement reversible. Enhancing the formula sturdiness, and blitzing it for that medical and satellite images for the better visibility, will most likely be our future.

V. REFERENCES

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