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ENHANCING IMAGE RECOVERY USING HISTOGRAM SHIFTING

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ABSTRACT

Reversible data hiding, in which the stego-media can be reversed to the original cover media exactly, has attracted increasing interests from the data hiding community. Recently, reversible data hiding (RDH) in encrypted images has gained attention form researchers, since it losslessly recovers original image from stegoimageafter extraction of embedded data while it also protects confidentiality of image's content (Sreekuttyetal, 2014).Kyung etal in their paper "Histogram primarily based reversible knowledge activity technique victimisation subsampling" mentioned that reversible knowledge activity technique guarantees that the initial cowl image fully recovered from the marked image once the hidden knowledge ar extracted. Medical imaging and law enforcement are some of the areas where this technique can be applied as distortions to original image are not acceptable in such fields. In this paper, various reversible data hiding algorithms based on histogram shifting have been discussed. In 2006, the reversible data hiding algorithm is proposed by Ni, etal (NSAS). However, recovery of embedded secret data is not possible unless knowledge of peak point and zero point of histogram are transmitted to the receiver (SamritiSharmaetal, 2003). In order to improve this shortcoming, Hwang, etal(HKC) proposed a new robust reversible data hiding scheme but it decreased the data hiding capacity. In this paper an efficient location map scheme by using only one bit is proposed, which can improve image recovery.

1. INTRODUCTION

Data activity, a style of steganography embeds knowledge into digital media for the aim of identification, annotation, and copyright various constraints have an effect on this process: the number of information to be secreted, the requirement for exchangeability of those knowledge below conditions wherever a "host" signal is question to distortions, e.g., lossy compression, and also the degree to that the information should be proof against interception, modification, or removal by a 3rd party. Asper the literature survey on performance of reversible knowledge activity formula during data hiding process, distortions affect the cover media and original image cannot be recovered from it in most cases.

That is even after extraction of hidden data, distortions persist in the cover media. In some applications, such as medical diagnosis and law enforcement, it is vital to reverse the stego image back to the initial cowl media once the hidden information is extracted for a few legal issues. Reversible informationhiding is that the technique that permits embedding (hide) information within a picture and later the embedded data is extracted pro re natal and therefore the actual copy of the initial image is found. One of the most requirements of reversible information concealing is that the distortions to the initial signal ought to be specified artefacts don't seem to be visible. Another demand

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is to possess higher embedding capability. The reversible information concealing is AN rising field for content authentication of pictures wherever the authentication data (say hash) is embedded within the image. The higher the capacity the more information can be embedded inside theimage. In this paper a review of reversible watermarking techniques proposed so far and suggestions on how to get reversible data hiding technique with high data hiding capacity and invisible artefacts is presented.

2.NEED FOR REVERSIBLE DATA HIDING

Reversible information concealing is specially used for the content authentication of transmission information like pictures, Videoselectronic documents etc. as a result of itsrisingdemandsin varied fields like enforcement,astronomical analysis, medical imagination etc. A critical requirement in this field is to have the original image in order to make right decision during judgment. Adequate security and integrity for content authentication isnot bonded victimisation stellate anduneven cryptograp hicaltechniques (T Kalkaretal, 2003). . Because the main problem with the cryptographic techniques is that they are irreversible. Some authors use synonyms distortion-free, lossless, invertible, erasable watermarking for reversible data hiding. The lossless watermarking, as explained by Kalkaretai, 2003, a branch of fragile watermarking, is the process through which exact original image is recovered after the embedded information is extracted from the watermarked image, if the watermarked image is deemed to be authentic, that means even after embedding payload to the original image not a single bit of watermarked image is changed. This technique embeds secret information with the image so that embedded message is hidden, invisible and fragile. The authentication process will fail if there is any attempt to change the watermarked image.

Reversible Data Hiding Techniques can be Classified into Two Types (young etai 201 2)

a.During cryptography, an expansion spectrum signal reminiscent of the data payload is superimposed on the host signal and through cryptography the payload (watermark signal) is subtracted from the watermarked image during a restoration step. While the vertical axis represents the number of pixels in that particular tone. The left aspect of the horizontal axis

b. Some features of the original image are replaced with the watermark payload. During embedding the initial parts of the image that may get replaced by watermark payload recompressed and passed as a region of the embedded payload and through the cryptography method this compressed payload-part is extracted and decompressed.

Therefore, the initial image is achieved by substitution the changed parts with these decompressed original options. The algorithms at point (a) offer visible artifacts and lower capacity and are more robust. On the other hand, algorithms atpoint (b) offer better visible quality and higher capacity and less robust than the first one.

3. REVERSIBLE DATA HIDING BY HISTOGRAM SHIFTING

As per the Wikipedia an image histogram is type of histogram which acts as a graphical representation of the tonal distribution in a digital image (Ed Sutton. "Histograms and the Zone System". Illustrated Photography). It plots the amount of pixels for every tonal worth. By observing the bar graph for a particularimage a viewer are going to be ready to decide the complete tonal distribution at a look. Image histograms are present on many modern digital cameras (Michael Freeman (2005). Photographers will use them as AN aid to point out the distribution of tones captured, andwhether or not image detail has been lost to blown-out highlights or blacked-out shadows (EdSutton). In fig l(b), the horizontal axis of the graph represents the total variations,

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The left aspect of the horizontal axis represents the black and dark areas, the centre represents and

Areas, the centre aspect represents light-weight and pure white areas. The vertical axis, on

Medium gray and also the other hand, represents the size of the area which is captured in each of these zones.

As per MasoudNosratietai, zero or minimum point of histogram is used in reversible data hiding technique. In this technique, first the peak value is compared with zero or minimum point in the histogram. If it is found lower than minimum point than pixel values are increased by one from higher than the peak to lower than the zero or minimum point in histogram. Then the whole image is searched for embedding. Once a peak-pixel value is encountered, if the bit to be embedded is 'I' the pixel is added by I, else it is kept intact. Alternatively, if the height worth is distinguished to be beyond the zero or minimum purposewithin the bar graph, the constituent worths area unit attenuated by one from under the heightto beyond the zero or minimum purpose and so so as to insert bit ' I' the encountered peak-pixel value is deducted by 1. The decoding process is opposite of the embedding Computationalcomplexity in their scheme. However, in this scheme the peak point will be changed after embedding secret data. Unless the receiver has the knowledge of peak and zero point of histogram, the embedded secret data cannot be recovered. The major problem was the transmission of additional information, peak point and zero point of histogram, from sender to receiver. To improve

placement map to store the reversible knowledge and provides a solution to resolve once the hosen minimum purpose isn't zero. However, their resolution canwaste the storage amount andreduce the
initial knowledge concealment capability. In this paper, an efficient location map by using only one

process.The formula basically doesn't follow the overall principleof lossless watermarking. Manytechniques concerning are projected for know ledge concealment however most of themsquare measure irreversible, which implies that the initial cowl image can't be recovered losslesssly from the stegoimage. However, in some applications like military, highenergy particle physical experimental investigation and medical imaging, it's desired to own the initial cowlmedia will as a result of the specified high-precision nature. The techniques satisfying this requirement are referred to as reversible data hiding techniques. In the literature, many reversible data hiding schemes based on histogram have been proposed. Recently NSAS algorithmic program used the zero or the minimum points of the bar chart of a canopy image and so slightly modify the constituent grayscale values to permit secretknowledge to be embedded. After experimental results and performance comparison analysis, they guarantee that low execution time and low

the above disadvantage, HKC algorithm was proposed, a robust reversible data hiding scheme based on histogram shifting method. In fact, they projected

4.REVIEW OF TWO REVERSIBLE DATA HIDING SCHEMES BASED ON HISTOGRAM

bit to record the change of the selected minimum point to improve the data hiding capacity has been set up.

Here, "Lena" image has been used as an example to illustrate NSAS algorithm. For a given grayscale

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image, say, the Lena image 512x512x8, first its histogram has been generated as shown in fig 2(b)

Fig 2(a) Lena

According to the NSAS algorithm the subsequent 3 steps entire the information embedding process:-\

Step l. discover the height point and the zero point in fig 2(b)A peak (zero) point corresponds to the gray scale value which the maximum (no) number of pixels in the given image assumes, e.g., as shown in Fig 2(b).For simplicity, it's been assumed that simplest one zero point at 255 and one peak factor at 154 are used in this scheme.

Step 2. Scan the whole image in a sequential order, such as row-by-row, from top to bottom. The gray scale value of pixels between one hundred fifty-five (which include 155) and 254(such as 254) is incremented with the aid of "1", i.e., transferring the range of the histogram, [155 254] to the proper-hand side through 1 unit and leaving the grayscale cost 155empty.

Step 3.Embed the secret statistics into the grayscale fee of 154 and 155.

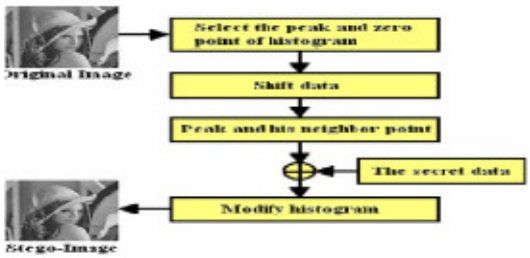

Fig3: The embedding process in NSAS Scheme

Then, the first image are often recovered to utilize reverse direction operation from stego-image within the receiver. Obviously, the info embedding capability of NSAS theme is adequate to the grey value of the height purpose. However, the height purpose in cover-image isn't an equivalent because the peak purpose in stego-image as a result of the height purpose in original image are going to be modified once embedding secret information. so as to recover the embedded secret information, the grey value of peak purpose and nil purpose within the original cover-image should be transmitted to receiver. This major drawback the way to transmit the extra info, the grey value of peak purpose and nil purpose, from sender to receiver is taken into account during this paper. In order to improve this shortcoming, HKC algorithm proposed a robust reversible data hiding scheme based on histogram shifting method. "Lena" image as an example has also been used. The following four steps complete the information embedding method as shownin Fig.4.

Step I.Find out the most purpose that is location of 154 and 2 minimum points that area unit location oftwenty three7 and 23 in Fig. 2(b).

Step 2.In order to recover original pictures, there's a location map to store locationinformation of the pixels that have most purpose, left minimum purpose, andright minimum purpose in HKC theme. The structure of location map is showin Fig. 5

Step 3.Generate the embedding area. These elements that area unit placed in histogrambetween left minimum purpose and left aspect of the most purpose (pixel price of 154) area unit shifted one pixel left.

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Step 4.Embed the secret data into the grayscale

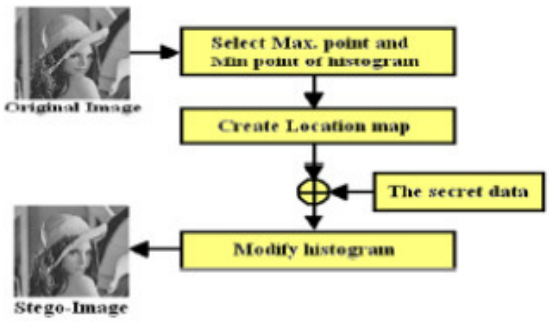

Fig 4: The embedding process in HKC Scheme

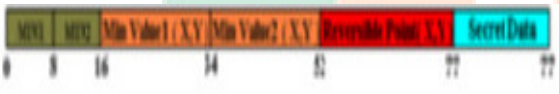

Fig 5: The structure of location map

has been used to show process of hiding data extraction and recovery of original image.solely search for the most purpose within the stego image so the key knowledge isrecovered within the HKC theme.Obviously, the data concealing capability is finite once one tries in original image has been selected. Therefore,theyincreaseseveral pairs in location map to enhance thecapability of embedding data into thecover-image. However, the capability ofembedding data candecrease ei ghteen bits once it will increase one minimum purpose within the location map whenever.what is more, toachieve the goal of ill the cover-image, it'll waste lots of concealing spacebecause it'snot possible for the numbers of minimum purpose is simply just one.

5.A NEW REVERSIBLE DATA HIDING SCHEMES

The major disadvantage within the HKC theme is to waste plenty of value of 152and 153 or 155 and 156.

concealing house to store these coordinates of minimum points within the location map. Here another record method to replace the method using in HKC scheme to improve the above disadvantage has been proposed. The following three steps complete the data embedding process in the proposed scheme.

Step 1.Generate the histogram of cover-image and then find out the maximum point (154) and two minimum points (237 and 23) in Fig.7.

Step 2.Set up the location map in order to recover original images. The structure of location map is show in Fig.9.

Step 3.Pixels shift and embed the secret data into the gray scale value of 152 and 153 or 155 and 156. The histogram of stego- image is shown in fig 8

Fig. 9. The structure of location map

In fact, the embedding process in this scheme is similar to HKC scheme but the method using to set up the location map is difference. during this planned theme, one bit to jot down down the primitive position to exchangevictimization to recollect the coordinates of minimum points within the original image has beenutilised. Hence, it'll scale back the scale of storage amount effectively so increase the actual factcapability of embedding info within the theme. Here, the content of proposed location map shown as Fig. 10 has been explained.

MINI: The minimum purpose corresponds to the gray value that the minimum range of pixels within the left aspect of peak purpose within the bar chart.

MIN2: The minimum point corresponds to the grey scale value which the minimum number of pixels in the right side of peak point in the histogram.

Value I: it's wont to bear in mind what

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percentage points should be recovered in left aspect.
Value2: it's wont to bear in mind what percentage points should be recovered in right aspect.
Lengthl: it's wont to note these points relationship in left aspect.
Length2: it's wont to note these points relationship in right aspect.

Hide Data: The fact capacity of embedding information.

Fig. to the structure of location map

receiver.

the most important drawback was a way to transmit the extra data, peak purpose and nil purpose of bar graph, from sender to receiver. To improve the on top of disadvantage,HKC rule was projected, a strong reversibleinformationconcealing theme suppo rted barshifting methodology. In fact, they projected the situationmap to store the reversible information and provides a solution to resolve once the chosen minimumpurpose isn't zero. However, their resolution wastes the storage amount andreduces the first information concealingcapability. In this paper, associate economical location map by exploitation only 1 bit to record the amendment of the chosen minimum purpose to boost theinformation concealing capability hasconjo intly been mentioned which may improve the information concealing schemes projectedearlier.

Here, an example to explain the difference of location map between this new scheme and HKC scheme has been given. There is a 3x3 picture shown as Fig. II. Then, it is used to remember the coordinate of the reversible points shown in Fig.II (a) and just only use one bit to record the neighbour point shown in Fig.ll (b). Comparing HKC scheme and the scheme which has been used in this paper, one can find that it needs to store the reversible data space in HKC scheme more than the used scheme. In particular, it will waste more storagecapacities to remember the reversible points' coordinates when the minimum points are not zero.

6.CONCLUSION

In NSAS, the embedded secret information can't be recovered once the information of peak and nilpurpose of bar graph aren't transmitted to the

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