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# An Image Steganography Algorithm Using Huffman and Interpixel Difference Encoding

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## ABSTRACT

***Steganography is associate degree art of activity secret info on a canopy medium through subliminal methodology. The 3 pillars on that a steganography algorithmic program ought to be erected are: Embedding capability, physical property and hardiness. it's lucky that each one these goals square measure mutualist on each other. The state of art is finding associate degree optimum resolution that sustain all the steganography goals. it's believed that there's no productivity if the scale of canopy medium gets extended to fulfill in housing the key knowledge thereon. This happens attributable to lack in refinement of embedding algorithmic program and failing in analyzing {the knowledge|the info|the information} structure of secret data. during this paper, an endeavor has created to enhance embedding capability and produce terribly less distortion to the quilt medium by analyzing the information structure of the payload. A residual secret writing is carried on the pay load before it's submitted to Huffman cryptography that may be a lossless compression technique. As a result, the illustration of payload had shrink. Further, the variable bit cryptography (Huffman) do a lossless compression and at last the payload get housed on the quilt medium. This finished with high embedding capability and fewer physical property. Peak signal to noise quantitative relation confirms that the residual secret writing had given jury-rigged results than few existing embedding algorithmic program.***

## 1. INTRODUCTION

Steganoraphy may be a hidden communication technique, during which the event of communication going down itself is hid. the quilt medium appropriate for steganography may be any entity which may be digitally diagrammatical [2]. Steganography technique remains winning, till the artifacts of the quilt medium remains intact. wrecking the quilt image unit whereas payload embedding is inevitable. however the unit of the quilt image may be preserved to a potential extent, if the adulteration get introduced on the quilt image is minimum throughout the payload get embedded thereon. up embedding capability and minimizing the distortion occurring to the quilt image stands trade-off. it's wiser to reduce the quantity (count) of distortion instead of dominant the prevalence of distortion. cyber web impact is that the general distortion occurring to the quilt image may be brought down. Despite of victimisation lossless compression technique like Huffman secret writing on the payload before embedding, someday still our payload can not be housed within the cowl image. This conveys America not solely to extend the scale of canopy image that's large enough to carry payload however conjointly within the alternative direction of viewing the applied mathematics structure of payload (secret data/image). normally most illustration of any info has vast volume of redundancy [1][9]. This redundancy will exist in many forms like spatially adjacent pixels in a picture square measure too march on their intensities too. this is often a breakthrough where one can exploit the property of Interpixel redundancy to form an endeavor in implementing Interpixel differences as coding model for representing a picture. This Interpixel difference coding will decrease the representation (file) size by the number of bits required to represent the image intensity. Since, we are going to code the Interpixel difference; the binary bit required will be lesser on an average. Exception exists in the boundary or edge region of an image where the Interpixel difference will be maximum.

## 2. BACKGROUND STUDY

**2.1 Interpixel Differencing Interpixel** differerencing technique is used in conjunction with Huffman coding to achieve higher data compression. Increasing the cover medium size to house the secret data on it should be the secondary option. If there is scope to determine the redundancy and eliminate the same with alternative representation technique, then the need of searching a big cover image to house the secret data can be avoided. One such attempt has been taken in the proposed work.

To represent the above 10 ×10 image matrix we require 100 × 8 = 800 bits. If the matrix is directly Huffman coded, it ends up with a binary representation requirement of 850 bits. But in reality this image matrix will be in larger size, so we get better compression. But look in other dimension of the same matrix with respect to structural characteristics of

it. Figure 2 shows the structural difference of the same matrix using Interpixel difference. In every row the first element remains the same, whereas ith element is the difference between ith pixel and i-1th pixel and i >0.
When the Interpixel difference matrix that is Fig.2 is fed as input matrix to Huffman encoding, it ends up with a binary representation requirement of 566 bits. When we apply the same to a larger scale there is scope to achieve better compression and this attempt has been carried out in the proposed work. The Interpixel difference matrix is reversible. Every rows first element of the Interpixel difference matrix is used as initial value and successively the rest of the elements is computed by referring the preceding value. Here ith element of every row is the Interpixel summation of ith pixel and i-1th pixel and i >0. The number of unique symbols (counts) in the Interpixel difference image (refer Fig.2) is more than original image (refer Fig.1). For some cases even it may be lesser i.e. Interpixel difference image has lesser symbol than original image. But the net effect is that, when Interpixel differencing technique is applied on an image for compression, it results in doing the compression with lesser number of bits. The bit rate is 5.66/pixel in the case of Interpixel difference technique. This include both the Huffman table and Huffman Encoding. 2.2 Huffman Encoding Huffman encoding [1][10][11] is a variable length lossless compression technique that can exactly reproduce the source data. Entropy of source symbol is given in equation 1.

Huffman encoding give compressed coding for the symbols provided as input. Huffman table has prefix free codes and corresponding symbols. Huffman table is used during Huffman decoding. Both the Huffman encoded prefix free binary code and Huffman table should be treated as payload and embedded in cover medium. The compression ratio depends on the count of the unique symbols and their frequencies. Lesser the symbol and higher the frequency results in higher compression, in contrast higher the symbols with less frequency results in lower compression. This is common in both text and image compression. Generally if the symbol count increases, this successively influences the scale of Huffman table. As a result the Huffman table entries get accumulated, that has impact on the compression quantitative relation. Huffman table is an extra overhead in Huffman cryptography technique.

## 3. CONNECTED WORKS

A script technique projected in [12] that relies on LSB replacement technique. variable lengths of secret bits get embedded in each constituent. In method1 inexperienced and blue square measure embedding channels keeping red channel as indicator channel. In method2 associate degree choice is provided for selecting the indicator channel among the 3 channels. Once chosen, the remaining 2 channel act as embedding channel. In method3 the indicator channel is chosen by rotation theme across all the pixels. within the 1st constituent red channel is indicator; inexperienced channel is that the indicator in second constituent and in third channel blue act as indicator. Once indicator is finalized the remaining 2 channels are going to be used for embedding. This theme is continual for the consecutive pixels. The Mean sq. Error (MSE) and PSNR is calculated for all channel and therefore the average range of bits get embedded in each constituent is shown in their results. A script technique projected in [7] relies nervy adaptational theme. absolutely the distinction between 2 adjacent pixels square measure the first criteria in distinctive the region for embedding secret message. They use LSBMR (Least vital Bit Matching Revisited) as their knowledge activity algorithmic program. solely a pair of secret bits may be embedded in every embedding unit and threshold T is employed in distinctive the embedding region. Region choice and canopy image activity capability is set through trial and error method. The grifter edge regions of canopy image alone square measure used for embedding. even supposing the embedding capability is lesser it face up to against applied mathematics attack and that they had established that RS steganalysis is ineffective in police work stego work. within the steganography theme adopted in [13], the embedding potency is improved by adopting matrix embedding technique. ME-RA (matrix embedding repeat accumulate) is that the knowledge activity algorithmic program accustomed hide the key knowledge. the explanation to settle on matrix embedding is to less adulterate the quilt image, at identical time the key knowledge bits ought to get embedded. Here, a overacting code matrix is used in achieving the goal. within the projected work, rather than hamming code (for matrix embedding) an easy XOR operation is performed on the host image bits to see its coincidence against the key bits. The host image bit is adjusted accordingly to suit the secret bits. A novel image steganography technique [14] was discussed in which the cover image's spatial value is transformed in to Discrete Cosine Transformation (DCT); its LSB is modified to match the secret message. The secret message is Huffman encoded prior to the embedding scheme which achieves a significant compression rate. A higher embedding capacity and PSNR is obtained using this technique. This technique is superior to the method proposed in [16]. A stenographic technique [15] based on wavelet transformation on the images is proposed. Discrete Wavelet Transformation (DWT) converts the spatial domain of cover image into frequency domain. Huffman compression is applied for the stream of secret bits before overlaying them on the cover image. A high PSNR and very high embedding capacity is achieved. A higher level of security is obtained because the Huffman table and encoding rules are black box to the intruder.
6. CONCLUSION

An Interpixel difference image steganography algorithm which brings a better PSNR than [12] is proposed. Histogram of stego image and cover image are almost equal which emphasize on the result that distortion between cover and stego image is minimum. Capacity improvement and distortion reduction has been addressed in this proposed technique. In the proposed work, the embedding capacity of the cover image is increased, at the same time the PSNR are also controlled.

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