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Enhanced Image Steganography using Texture Synthesis

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ABSTRACT: A texture synthesis process resample a smaller texture image, which synthesizes a new texture image with a similar local appearance and an arbitrary size. the texture synthesis process into Steganographic to conceal secret messages. In contrast to using an existing cover image to hide messages, our algorithm conceals the source texture image and embeds secret messages through the process of texture synthesis. This allows us to extract the secret messages and source texture from a Stego synthetic texture. This approach offers three distinct advantages. First, scheme offers the embedding capacity that is proportional to the size of the Stego texture image. Second, a Steganalytic algorithm is not likely to defeat our Steganographic approach. Third, the reversible capability inherited from our scheme provides functionality, which allows recovery of the source texture. algorithm can provide various numbers of embedding capacities, produce a visually plausible texture images, and recover the source texture.

KEYWORDS: Data embedding, example-based approach, reversible, Steganography

I. INTRODUCTION

Steganography a singular method of information hiding techniques . It embeds messages into a host medium in order to conceal secret messages so as not to arouse suspicion by an eavesdropper. A typical Steganographic application includes covert communications between two parties whose Steganography [1] is a particular method of information hiding techniques. It inserts the messages in to the host medium in order to hide the secret messages so as not to arouse mistrust by an eavesdropper .The typical Steganographic application includes translate the communication between two parties whose presence is unknown to a possible attacker and whose success depends on detecting existence of this communication[3]. Generally the host medium used for Steganography includes meaningful digital media such as digital image ,text, Audial, video, 3D model [4] etc. The texture synthesis process will hide the secret messages and source texture. It will also allow us to mine the secret messages and source texture from Stego synthetic texture. Steganography a singular method of information hiding techniques. It embeds messages into a host medium in order 0suspicion by an eavesdropper. A typical Steganographic application includes covert communications between two parties whose existence is unknown to a possible attacker and whose success depends on detecting the existence of this communication. In general, the host medium used in Steganography includes meaningful digital media such as digital image, text, audio, video, 3D model, etc. At The past method can deploy the phishing attack by the adversary. The proposed of system using Steganography using reversible texture. Using weave the texture synthesis process into Steganography to conceal secret messages

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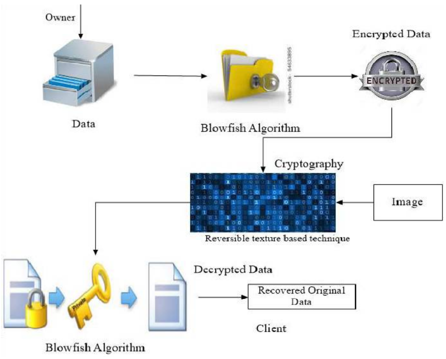

Fig1- Architecture diagram for Steganography

A.JPEG Compression algorithim:

JPEG is an image compression standard developed by the Joint Photography Experts Group. The main purpose of JPEG image compression is to store the data necessary to reconstruct an image using as little space as possible. Most commonly JPEG a lossy compression algorithm and as the name suggests, some information is removed from the image when compressing. This algorithm achieves much of its compression by exploiting the limitations of the human eye. Because human eyes are less sensitive to higher frequency, compression can be achieved by suppressing the high frequency components. JPEG is used to compress either full color or gray scale images. In the case of color images, RGB is transformed into a luminance/chrominance color space (Y Cb Cr, YUV, etc.). This is done to allow different processing on the luminance and chrominance components. The pixel values for each component are divided into 8x8 blocks and the DCT is applied to each block. The resulting coefficients are then quantized. The larger the quantization coefficients, the more data are lost. After quantization, zigzag scan is performed on these quantized 8x8 blocks. The purpose behind this is to retain DC an low frequency components and discard high frequency components. Zigzag coefficients are encoded by Run Length and Huffman coding. This step is lossless.

B.Line-Based Cubism-like Approach

Now days, the subject of automatic generation of art image creation by using the computers increases the interests of many computer users. In the paper the author invent new algorithms of producing art images by the method of stroke-based rendering. This is an automatic method for producing non-photorealistic imagery, but it uses the stipples and paint strokes. The primary goal is to create the art image which is same like the other type of images. The mosaic image is a made up with tiny identical tiles for example squares, triangle and circles and so on. This mosaic image is one type of computer art image Instead of the normal nature of mosaic image is tiles are arranged in a fixed pattern.

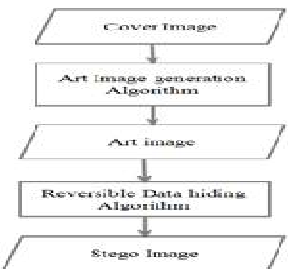

Fig2- Line-Based Cubism-like Approach

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C. Markov Random Field (MRF) Method:

Fast Texture Synthesis using Tree-structured Vector Quantization, Author Li- Yi Wei and Marc Levoy present a simple algorithm that can synthesize different type of textures. The inputs to the algorithm contain any random noise image with user specified size and an example texture patch. To make the visually plausible image like given example the algorithm makes modifications in random noise image. Since this technique require only example texture patch it becomes flexible and easy to use. Though it will take some time to generate new texture it gives the guaranty of tileability of image. There are two major components in the algorithm, the searching algorithm and multi resolution pyramid. The advantages of this algorithm are its image processing speed and image quality: The algorithm give better quality of synthesized image texture than previous techniques, while it increase the computation speed twice faster order of magnitude than older approaches which generate same result as this algorithm. This allows us to use this algorithm in those applications where texture synthesis is considered as very expensive method. The algorithm is extended to include motion texture synthesis and image editing. The algorithm use Markov Random Fields (MRF) for the texture model, since it has been proven that MRF is useful to cover the wide variety of texture types. It develop a synthesis procedure to avoid sampling, explicit probability construction, expenses in computation of MRF.

II. LITERATURE SURVEY

Texture synthesis has gotten a great deal of consideration as of late in computer vision and PC graphics. The latest work has concentrated on texture synthesis by sample, in which a source texture image is re-examined utilizing either pixel-based or patch-based algorithms to deliver another synthesized texture image with comparative neighbourhood appearance and subjective size. Pixel-based algorithms produce the orchestrated picture pixel by pixel and use spatial neighborhood correlations to pick the most comparable pixel in an example composition as the yield pixel. Since every yield pixel is dictated by the as of now integrated pixels, any wrongly blended pixels amid the procedure impact whatever remains of the result bringing about proliferation of blunders.

A. A non-parametric method for texture synthesis

A. A. Efros [11] presented a non-parametric method for texture synthesis. The texture synthesis process emerges a new image outward from an initial seed; consider one pixel at a time. The objective of this method is to preserve local structure and produces good results for a wide variety of synthetic and real-world textures. The algorithm considers texture, pixel by pixel, outwards from an initial seed. First, chose a single pixel so that the model captures high frequency information as possible. Using probability tables for the distribution of single pixel can be synthesis the process by using all possible contexts. An approximation can be getting by using various clustering techniques. This method generates texture as a Markov Random Field (MRF). It assumes the probability distribution of brightness values for a pixel given the brightness values of its spatial neighborhood and the rest of the images are independent. The neighborhood of a pixel is design as a square window around that pixel.

B.Patch-based algorithms

Patch-based algorithms attach patches from a source texture rather than a pixel to synthesize textures. The method of Cohen et al. and Xu et al. improves the image quality of pixel-based synthetic textures because texture structures inside the patches are preserved. However, since patches are attached with a small overlapped region during the synthetic process, one has to make an e_ort to ensure that the patches agree with their neighbors.

C.Hide and seek: an introduction to steganography

AUTHORS:N. Provos and P. Honeyman Although people have hidden secrets in plain sight-now called steganography throughout the past times, the recent improvement in computational technology and power has driven it to the forefront of today's security approaches [2]. Essentially, the information-hiding method in a steganographic system starts by identi-fying a cover medium's redundant bits (those that can be modified without destroying that medium's probity or

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honesty). The embedding method creates a stego medium by replacing these no longer useful bits with data from the hidden message.

D. Exploring steganography

Seeing the unseen,AUTHORS: N. F. Johnson and S. Jajodia Steganography is the technique of hiding information in such a way that it could prevent the detection of hidden messages [1]. It includes a vast data of secret communications methods that hides the message's existence itself. These methods include hidden inks, microdots, character manipulation, digital signatures, covert channels, and spread spectrum communications. Steganography and cryptography are brothers in the spy craft family: cryptography encrypts a message so that it cannot be understood by the hacker while steganography hides the message so their existence cannot be predicted by anyone. In this article the writers discuss images and how to hide information within the images, and later they discuss about results obtained from extracting available steganographic software.

III.PROBLEM STATEMENT

Most image steganographic algorithms adopt an existing image as a cover medium. The expense of embedding secret messages into this cover image is the image distortion encountered in the stego image. The most recent work has focused on texture synthesis by example, in which a source texture image is re-sampled using either pixel-based or patch-based algorithms to produce a new synthesized texture image with similar local appearance and arbitrary size.

A. Scope

- Major parts of system will include Texture synthesis, Message embedding and Source texture recovery, Message extraction, Message authentication.
- To develop an system which can be easily embed in different applications where security is the main concern.
- To implement a system which will reduce overheads of text or image encryption algorithms.
- To develop a system which will retain the quality of service and the system performance.

B. Objective

- To generate texture image patches.
- To generate Index table and Composite image.
- To embed message in the source texture without disturbing quality of the texture.
- To extract the data with no change

IV. PROPOSED WORK

The proposed enhanced approach for steganography using reversible texture synthesis. A texture synthesis process re-samples a small texture image drawn by an artist or captured in a photograph in order to synthesize a new texture image with a similar local appearance and arbitrary size. The texture synthesis process into steganography concealing secret messages as well as the source texture. In particular, in contrast to using an existing cover image to hide messages, our algorithm conceals the source texture image and embeds secret messages through the process of texture synthesis. This allows us to extract the secret messages and the source texture from a stego synthetic texture. The three fundamental differences between our proposed message-oriented texture synthesis and the conventional patch based texture synthesis are described in following: The first difference is the shape of the overlapped area. During the conventional synthesis process, an L-shape overlapped area is normally used to determine the similarity of every candidate patch. In contrast, the shape of the overlapped area in our algorithm varies because we have pasted source patches into the workbench. Consequently, our algorithm needs to provide more exibility in order to cope with a number of variable shapes formed by the overlapped area.

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A.PROPOSED SYSTEM ARCHITECTURE

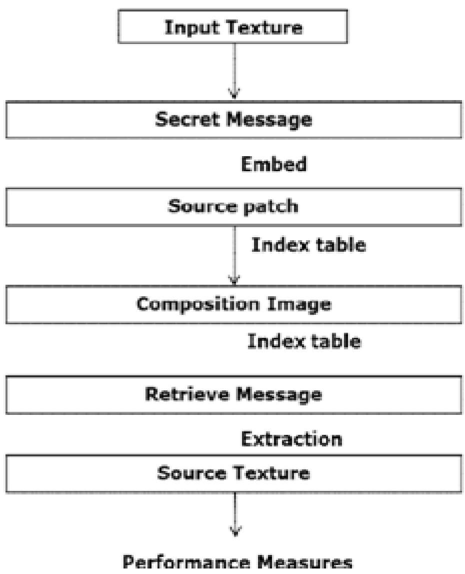

Fig-3:System architecture

B.Embedding

In this module the secret message is placed inside the input patch by using DCT. The input texture is decomposed using DCT. The secret information is placed in the low coefficient of the image. To embed the message in the image the discrete cosine transformation is applied to the image.

$$X_k = \sum_{n=0}^{N-1} x_n \cos\left[\frac{\pi}{N}\left(n+\frac{1}{2}\right)k\right]$$

Where
x- Image pixels
N- Size of the image
K-The image pixel position
The obtained DCT coefficients were then combined with the message inorder to produce the source patch.

[Cipher]_p=(([DCT]_p+[msg]_p))2

Where[Cipher]_p is the resulting source patch. [DCT]_p is the DCT coefficient of image. [msg_]p is the input message to be hided. Firstly the Discrete Cosine Transform (DCT) of the cover image is obtained. Then the stego image is constructed b y hiding the given secrete message image in Least Significant Bit of the cover image in random locations based on threshold. DCT coefficients determine the randomized pixel locations for hiding to resist blind steganalysis methods such as self calibration process by cropping some pixels to estimate the cover image features. Blind steganalysis schemes can be guessed easily hence the proposed technique is more practically applicable.

C.Intex table creation

The obtained source texture is then placed in the image matrix with the help of the index table which acts a key for image composition The patch which contains the first part of the message is placed in a location and in the index matrix

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the corresponding location is denoted as 1 and so on. The locations where the secret message is not present were denoted in the index table as -1.

D. Pasting the Image patches

The index table obtained acts as the key for the extraction of the secret information. The indexing regions that are having value -1 is replaced with the help of the original image patches .The other regions were replaced with the embedded image that contains the secret information corresponding to the number in that place. The resulting image is the composited image with secret information hided

E. Extracting secret message.

The image patches that are having the values other than -1 contains the secret message. The secret message is retrieved by reversing the embedding process

$$msg_p = [(Cipher]_p * 2) - DCT_p$$

where $Cipher_p$ is the resulting source patch. DCT_p is the DCT coefficient of the image. Msg_p is the input secret message to be hided. The identified secret information is then arranged so that the hided message is retrieved.The arrangement is done by placing the extracted secret information in the order corresponding to the order denoted in the index table.

G. Performance Analysis.

The performance of the process is measured by calculating BPP and Total embedding capacity.

$$BPP_{max} = [\log_2 [(S_w - P_w + 1) * (S_h - P_h + 1)]]$$

$$SP_n = \left[\frac{S_w}{P_w - (2 * P_d)} + 1\right] * \left[\frac{S_h}{P_h - (2 * P_d)} + 1\right]$$

$$TP_n = \left[\frac{(T_w - P_w)}{P_w - P_d} + 1\right] * \left[\frac{(T_h - P_h)}{P_h - P_d} + 1\right]$$

$$EP_n = TP_n - SP_n$$

$$TC = BPP * EP_n$$

BPP_{max} - Bits per pixel
SP_n - Number of source patches obtained
TP_n - Number of synthetic patches obtained
EP_n - Number of embedded patches
TC – Total Embedding capacity

The BPP value and TC value should be high which indicates that the embedding capacity of our proposed methodology is high.

H.Compression Algorithm

JPEG algorithm has four modes and many options. It is more like a shopping list than a single algorithm. For our purposes, though only the lossy sequential mode is relevant, and that one is illustrated steps of JPEG algorithm Furthermore, we will concentrate on the way JPEG is normally used to encode 24-bit RGB images.

Step 1: of encoding an image with JPEG is block preparation. For the sake of specificity we assume that the JPEG input is a 640×480 RGB image with 24 bits/pixel. Since using luminance and chrominance gives better compression, we first compute the luminance Y and the two chrominances Cb, Cr and the inverse, according to the following equations1, 2

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$$Y = 0.299R + 0.587G + 0.114B$$
$$Cb = 0.564(B - Y)$$
$$Cr = 0.713(R - Y) \qquad \text{-------------} (1)$$
$$R = Y + 1.402Cr$$
$$G = Y - 0.344Cb - 0.714Cr$$
$$B = Y + 1.772Cb \qquad \text{---------------}(2)$$

Separate matrices are constructed for Y, Cb, and Cr, each with elements in the range 0 to 255. Next, square blocks of four pixels are averaged in the Cb and Cr matrices to reduce them to 320×240. This reduction is lossy, but the eye barely notices it since the eye responds to luminance more than to chrominance. Nevertheless, it compresses the total amount of data by a factor of two .Now 128 is subtracted from each element of all three matrices to put 0 in the middle of the range. Finally, each matrix is divided up into 8×8 blocks. The Matrix has 4800 blocks; the other two have 1200 blocks each.

Step 3: JPEG is to apply a DCT (Discrete Cosine Transformation) according to equation 3 and 4 to each of the 7200 blocks separately. The output of each DCT is an 8×8 matrix of DCT coefficients. DCT element (0, 0) is the average value of the block. The other elements tell how much spectral power is present at each spatial frequency. In theory a DCT is lossless but in practice using floating-point numbers and transcendental functions always introduces some round off error that results in a little information loss.

$$F(u,v) = \frac{1}{4} C(u)C(v)\left[\sum_{x=0}^{7}\sum_{y=0}^{7} f(x,y) * \cos\frac{(2x+1)u\pi}{16} \cos\frac{(2y+1)v\pi}{16}\right] \qquad \text{----}(3)$$

$$f(x,y) = \frac{1}{4}\left[\sum_{u=0}^{7}\sum_{v=0}^{7} C(u)C(v)F(u,v) * \cos\frac{(2x+1)u\pi}{16} \cos\frac{(2y+1)v\pi}{16}\right]$$

where: $C(u),\ C(v) = 1/\sqrt{2}$ for $u,v = 0$;

$C(u),\ C(v) = 1$ otherwise.

---(4)

Once the DCT is complete, JPEG moves on to step 3, called quantization. In which the less important DCT coefficients are wiped out. This lossy transformation is done with table quality 50 by dividing each of the coefficients in the 8×8 DCT matrix by a weight taken from a table. If all the weights are 1, the transformation does nothing. However, if the weights increase sharply from the origin, higher spatial frequencies are dropped quickly. we see the initial DCT matrix, the quantization table and the result obtained by dividing each DCT element by the corresponding quantization table element. The values in the quantization table are not part of the JPEG standard. Each application must supply its own allowing it to control the loss-compression trade-off

Step 3: reduces the (0, 0) value of each block (the one in the upper-left corner) by replacing it with the amount it differs from the corresponding element in the previous block. Since these elements are the averages of their respective blocks, they should change slowly, so taking the differential values should reduce most of them to small values. No differentials are computed from the other values. The (0,0) values are referred to as the DC components the other values are the AC components.

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Step 4: linearizes the 64 elements and applies run-length encoding to the list. Scanning the block from left to right and then top to bottom will not concentrate the zeros together, so a zigzag scanning pattern is used
Step 5: Huffman-encodes the numbers for storage or transmission assigning common numbers shorter codes that uncommon ones.

I.DESIGING FORMULAE

To check whether the method proposed in this project is good, we need to calculate PSNR Value which is normally calculated to find the noise of the image. For calculating the PSNR value we have to find out the MSE value.
1. PSNR (Peak Signal to Noise Ratio): It is the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the reliability
of its representation. This ratio is mainly used as a quality measurement between the original and compressed image. The higher the PSNR, the better the quality of the compressed image.
10 *log10(5 _ 5=MSE)

2. MSE (Mean Square Error): Mean Squared Error is the average squared difference between a reference image and a distorted image. An Image Steganography
technique is able if it gives low MSE.
MSE = Noise=(no of rows _ no of colum)

3.SNR (Signal to Noise Ratio): It compares the level of a desired signal to the level of background noise. It is defined as the ratio of signal power to the noise power.
10 log10(signal=noise)

V.ADVANTAGES Of PROPOSED SYSTEM

1. The texture synthesis can synthesize an arbitrary size of texture images, the embedding capacity which our scheme is proportional to the size of the stego texture image.
2. A steganalytic algorithm is not likely to defeat this steganographic approach since the stego texture image is composed of a source texture rather than by modifying the existing image contents.
3. The reversible capability inherited from our scheme provides functionality to recover the source texture. Since the recovered source texture is exactly the same as the original source texture, it can be employed to proceed onto the second round of secret messages for steganography if needed.

VI..RESULTS AND DISCUSSIONS

The proposed method is tested on several color and gray images, some of which are taken from other studies in the literature in order to make a comparison. The Fig. shows some texture synthesis results using the proposed algorithm. Pro-posed method works well for a wide range of textures.

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Input images	Stego Image	Comparision Ratio	Data inserted	MSE	SNR	PSNR
		40%	Good Morning	147.0	18.82	26.45
		74%	Reversiable texture Synthesis	66.31	22.52	29.91
		83%	Image Steganography	219.97	16.68	24.71
		104%	Hi this is my first program	57.9	22.17	30.50
		57%	Hello hi	394.50	14.12	22.17

Fig-4.PSNR ,MSE,SNR results of the proposed technique

A. PSNR comparision grapf of existing and proposed system

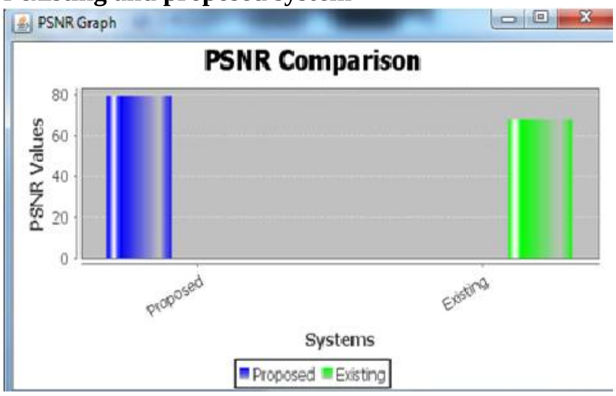

Fig-5.PSNR results of the proposed technique

B.Result After comparision of image

We take four images for test, in different size and different quality, the size of the first image is 192 Kb the result shows after compression become 7.4 Kb, the peak signal to noise ratio 31.9 while the size of image 2 is 74.3 Kb become 2.4 Kb ,the peak signal to noise ratio 34.8, and the size of image 3 is 74.3 Kb when compressed become 2.8 Kb while PSNR 32.3,the size of image .4 is 74.3 Kb become 5.4 Kb , PSNR is 28.9 the Fig. show input images and Fig. show output images .

Fig-6:Input Images

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NO of image	Size of original image	Size after image compression	PSNR
Image1	192	7.4	31.9
Image2	74.3	2.4	34.8
Image3	74.3	2.8	32.3
Image4	74.3	5.4	28.9

Fig7- :Result optained after comparision of image

Fig8-:.output Images

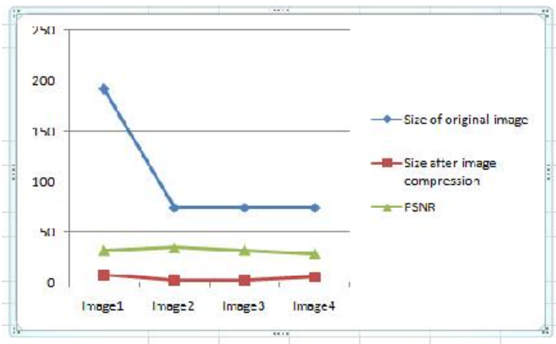

Chart 1- Graph of original images compressed Images

VII.CONCLUSION FUTURE WORK

This paper proposes a reversible steganographic algorithm using texture synthesis. Given an original source texture, our scheme can produce a large stego synthetic texture concealing secret messages. The JPEG image compression algorithm provides a very effective way to compress images with minimal loss in quality .Although the actual implementation of the JPEG algorithm is more difficult than other image format (such as png) and the actual compression of image is expensive computationally, the high compression ratios that got attained using the JPEG algorithm easily compensate for the amount of time spent im-plementation the algorithm and compressing an image that give good result that indicate 36.5 of PSNR.

In future A review of the other modes of operation of the JPEG algorithm. Applications of the DCT or similar transforms to the compression and manipulation of other kinds of data.

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