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Highly Secure Communication using Reversible Texture Synthesis

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Abstract: *Steganography is a procedure for hiding text inside digital media such as image, audio, video. Secrete communication is must require while transferring data from sender to receiver. For protecting data, we need to hide the data instead of converting into cipher text. If we are using cryptography technique; the third person or attacker may steal the information after using any effective algorithm to decipher the information. In-order to make more complex to the hacker we are using steganography concept, using this concept any user can hide the information inside image or audio or video. And the receiver can extract information from these digital media. In this paper we are proposing secure reversible texture steganography, compare to old approaches this approach is totally new one and in the olden approaches we directly embedded text into images this leads distortion. But using this new proposed technique we can overcome distortion problem.*

Keywords: *Reversible data hiding, image encryption, privacy protection, signal classification*

I. Introduction

Secure Reversible texture steganography in an image is a technique, by using this technique original covered image can be recovered lossless. Recently, several steganography techniques have been proposed for protecting images of secrete information like medical images, military images and forensic images. And these methods allow to the receiver to restore exactly the original images from embed image. In steganography various methods have been proposed. Among those methods the most frequents are LSB technique and Histogram Shifting technique and Expansion Embedding technique.

Security is extremely necessary for any communication procedure and it exhausted the knowledge in the technology. Because the electronic usage of content and sharing became predominant, it became imperative to safeguard communications from malicious attacks. Adversaries will hack data for financial and different gains. To beat these problems several techniques came into existence. Cryptography is one amongst the renowned approaches. That area unit accustomed have mechanisms like secret writing and cryptography. Secret writing is that the method of changing plain text into cipher text that isn't human decipherable. The cryptography is that the reverse method that converts the cipher text into plain text. The threat prone with cryptography is that the encrypted message will be hacked and hackers will try to acquire the initial text by employing a methodology called scientific discipline. To beat this issue steganography came into existence.

Steganography is that the method of embedding secret messages into a canopy image or video or audio file. The key message can even be encrypted before embedding into the image or cowl media. This procedure is wide accustomed share secret messages. But several such steganography approaches resulted in distortion. The first image got distorted that causes another drawback. There on several techniques came into existence to beat these problems. they're called reversible knowledge concealment mistreatment steganography. These ways were used effectively to avoid distortion as they're reversible with high chance. Recently Shanghai dialect and Wang planned reversible knowledge concealment approach supported reversible texture synthesis technique. Their work is that the inspiration for this paper within which we have a tendency to enforced a texture synthesis based mostly reversible knowledge concealment technique which is distortion free. The planned system offers a lot of capability for knowledge concealment, recovery of original texture and talent to resist attacks launched by adversaries.

II. Literature survey

This section reviews literature on the present state of the art on steganography using reversible texture synthesis and other related topics. Texture synthesis has been around for many years to have image processing and applications in computer vision besides computer graphics. It is explored in 1] for showing different approaches to exploit texture synthesis. Texture synthesis is used by many recent studies the given texture samples are re-sampled using different techniques such as patch-based and pixel-based algorithms in order to have a new texture which has been synthesized which contains arbitrary size and local appearance. Pixel based algorithms are explored in [2], [3], and [4] for generating synthesized content with pixel by pixel. They also

used comparisons in spatial neighborhood in order to find similar pixels while producing output pixels. The output pixels thus produced are determined by the pixels that have been synthesized and also the pixels that are synthesized wrongly while performing the operations. Thus errors might be propagated to the target image.

Later on researchers named Otori and Kuriyama [5], [6] combined the process of pixel based texture synthesis and data coding. They explored the dynamics of such hybrid approach. The messages that are to be hidden are encoded into something known as color dotted patterns. Then a blank image was used to directly paint them on it. The rest of the pixels are coated by pixel-based algorithms to exploit texture synthesis approaches which are pixel-based in order to conceal the presence of dotted patterns. Afterwards in order to extract such messages, they took the print out of the image of the stego synthesized and data-detecting mechanism was applied. The capacity of their method depended on the bulk of dotted patterns available. More over their approach had small error rate while message was being extracted. With respect to patch-based algorithms, researchers found in [7] and [8] employees paste patches from texture of source in order to have synthesis instead of using pixels to achieve synthesized textures.

The pixel-based synthetic approach was explored by Cohen et al. and Xu et al. for improving quality of pixel-based synthetic textures. While performing synthesis process in a small overlapped region, small patches are used. In order to achieve synthetic process an effort is needed to ensure that the patches are in compatible with neighbors. Patch-base sampling strategy was introduced by Liang et al. [9] for having overlapped areas with feathering approaches with respect to adjacent patches. After this approach came into existence Efros and Freeman [10] presented a new mechanism known as patch stitching. This approach was also named as image quilting. Their algorithm searches the given source texture for every new patch that needs to be synthesized and stitched. Then the algorithm chooses selects a candidate patch is capable of tolerating error ratio which has been pre-defined. The error rate toleration is pertaining to overlapped region and neighbors.

Afterwards, in order to disclose error path with the help of overlapped region, a dynamic approach was proposed. This approach makes use of an optimal boundary between the synthesized patch and the chosen candidate patch. This will result in production of patch stitching which is visually plausible. Ni et al. [11] proposed an algorithm for reversible data hiding. This algorithm can recover the original image without distortion. The distortion is considered here. When distortion is not there in the recovered image it is known as reversible data hiding. When data is hidden in an image or any media file, it is known as steganography. The steganography is also known as data hiding. When data is hidden into an image and retrieved from the image later, this concept is known as steganography. When text is retrieved from the original image without causing distortion, it is known as reversible data hiding.

From many existing techniques, histogram shifting is one of the preferred approaches that support reversible data hiding. The modification to pixels is controlled by such techniques thus limiting the distortion when data is embedded into images. Li et al. [12] focused on the current academic thinking on image data hiding. They proposed a generic framework that is used to have reversible data hiding. They also focused on the patch-based texture synthesis known as steganography. The focus of this paper is to have the benefits of patch-based methods that are used to embed text into images while making synthesizing procedure. Then the source texture is recovered when the extraction procedure is applied. Thus reversible data hiding is achieved.

III. Proposed Method

Steganography is a wonderful technology and it suggests of conversing covertly and it guarantees on the integrity of the channel of communication. It’s not even necessary for 2 parties to comply with a secret key beforehand. However, within the presence of an energetic Receiver, it's troublesome to stop squeeze of the covert messages. Steganography would be a decent tool for concealment data in channels wherever the innate suspicion of its use is low, like e-mail or websites, however a poor tool wherever wardens/attackers will safely assume that steganographic techniques are being utilized, like high-value media streams.

We planned a texture synthesis a primarily based approach to own steganography. The approach is illustrated as shown in Figure one. The most focus of this technique is to form use of texture image as supply texture so as embeds secret messages into a picture. Previous strategies targeted on direct embedding of text into image. Our approach is to form use of a lot of subtle to attain steganography. Initial of all a texture image is known. Then the image into that steganography is applied is additionally known. A random range is employed to come up with index table which can guide embedding method. Source texture is that the texture that facilitates knowledge embedding. The index table and supply texture are taken as inputs and a composition image is generated. From this cryptography is formed by exploitation each composition image and secret image. Finally, cryptography method is completed once there's association in nursing genuine approach that makes use of encoding process of the image and texture synthesis image. The results later this cryptography method produces the final stego image.

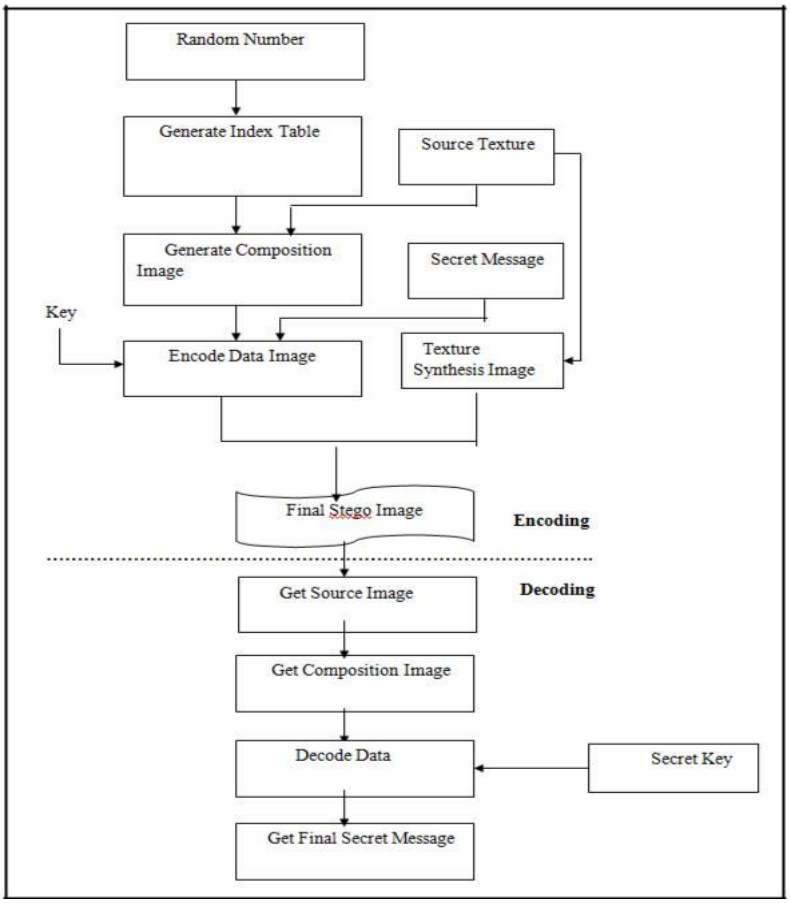

Figure 1 – Overview of the proposed steganography

The decoding process starts by obtaining source image from stego image. Afterwards the composition image is obtained. Then an authenticated process is followed in order to decode data and get final secret image. A salient feature of this approach is that the secret message sharing is done without distortion to original image. That is the reason it is known as reversible data hiding based on the texture synthesis approach.

IV. Results

Mean Square Error (MSE) of the overlapped region between candidate patch and synthesized area is computed in order to know the dynamics of the embedding and extraction processes. The results are presented here showing how embedding and extraction are taken place besides the MSE information.

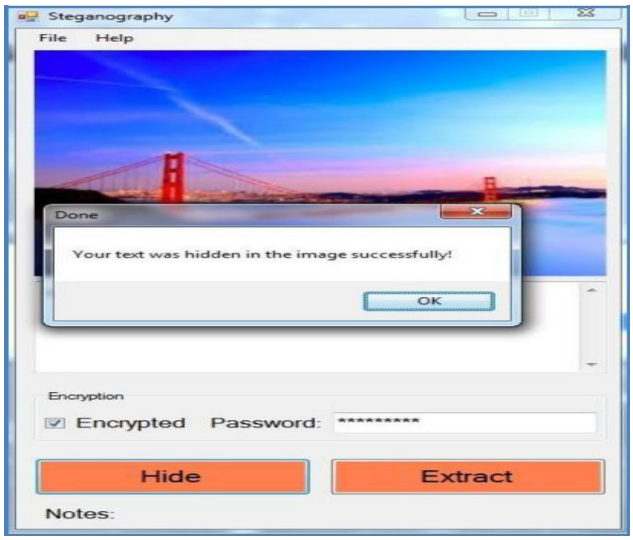

Figure 4 – Shows encoding process

As shown in Figure 4, the encoding process starts with an image, texture image and secret message as inputs. A password is set while encoding that will ensure that only authorized people can decode it. Very important observation here that the given secret message in the text area of UI shown in Figure 4 is encrypted before encoding. The reason behind this is that the encrypted message even when stolen cannot disclose sensitive information. The given message is hidden into the image by following the proposed encoding method.

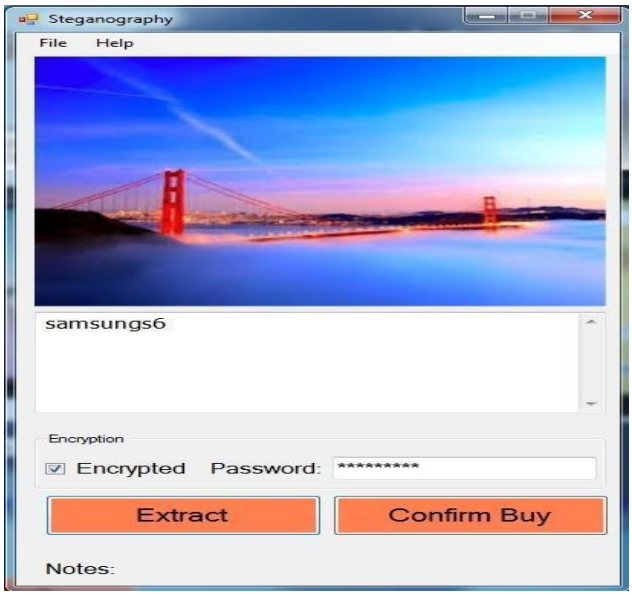

Figure 5 – Shows decoding process

As shown in Figure 5, the decoding process starts with due authentication. Once authentication is done successfully, it does mean that only authorized person is trying to decode the secret message. The decoding starts as described in the decoding module earlier. The decoding message and decryption takes place. The result is presented in the text are presented in Figure 5. The decoding finds the purpose served and thus the proposed application is able to demonstrate the proof of concept.

MSE	RANK
1020	3
55	0
705	2
230	1

Table 1 – Shows MSE dynamics

As shown in Table 1, the mean square error computed and the corresponding ranking of the MSE for different experiments are presented. The results revealed that there is MSE to show the dynamics of the procedures followed.

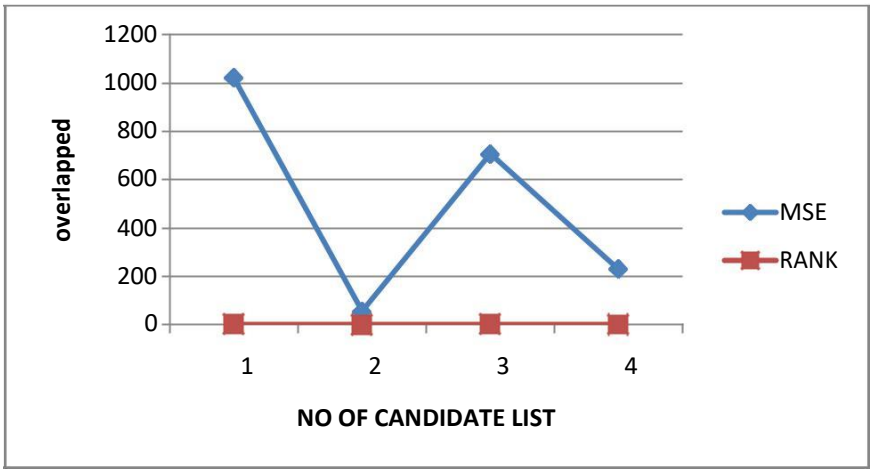

Figure 6 – Visualization of MSE dynamics and corresponding rank

As shown in Figure 6, it is evident that there are the overlapped regions and thus MSE is computed and presented. The horizontal axis represents number of candidate patches while the vertical axis represents the rank or MSE value.

V. Conclusions & Future Work

In this paper we studied highly secure communication using reversible texture synthesis. Texture synthesis approach is relatively new in embedding secret messages into images. Image steganography has been around for many years. However, there have been issues pertaining to distortion. The cover image used for secret writing method or embedding method is distorted by the time once message is extracted from the image. This can be the most concern in most of the steganography procedures that came into existence. Recently researchers tried to use texture synthesis to own more practical and secure steganography besides eliminating distortion. During this paper we tend to plan a strategy that's used for texture synthesis primarily based secret writing for steganography. We tends to apply the technique to a true time application wherever there's want for sharing secret messages so as to own more usage of the appliance. Each secret writing and secret writing processes area unit, finished due authentication to avoid unauthenticated access to the procedures named secret writing and secret writing. The MSE and rank of the MSE area unit computed to judge the planned approach. The empirical results unconcealed that the planned system is effective and distortion free. This analysis may be more extended to implement texture synthesis primarily based approach to video and audio covers in future.

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Bibliography

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