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Steganography Using Texture Synthesis- A Review

Akhade K. O.[1], Pingle S. V.[2] Vidhate A. D.[3]

PG Student, Dept. of CSE, SKN Sinhgad College of Engineering, Pandharpur, Maharashtra, India[1]

Assistant Professor, Dept. of CSE, SKN Sinhgad College of Engineering, Pandharpur, Maharashtra, India[2]

Phd Student, Dept. of ECE, K L University, Vijayawada, Andhra Pradesh, India[3]

ABSTRACT: The steganography is a key technique used in various fields of communication where security is essential. The data hiding can be obtained by using different texture synthesis techniques such as reversible texture synthesis, patch based sampling, image quilting & non-parametric sampling. This paper analyzes the different steganography techniques using texture synthesis and their performance outcome in terms of detection performance, embedding capacity, PSNR and technology used which allows the designers to opt the most suitable texture synthesis technique for specific application.

KEYWORDS: Steganography, texture synthesis, data embedding , patch ,Wang tiles, histogram shifting , reversible data hiding.

I. INTRODUCTION

In today's world digital information transmission is popular as millions of users communicate with each other with the help of different communication techniques so security is a main concern. Steganography is a technique used to conceal data while communication, still steganographic systems security depends on the data embedding procedure. In steganographic communication both sender and receiver should agree with shared secret key steganographic system. Shared secret key is important to detect how message is encoded in cover medium. Secret key and secret message is given to the steganographic system then steganographic system determines how to encode secret message in cover medium with the help of secret key. The result is stego image that sends to receiver. When destination user receives stego image it uses shared secret key and steganographic system to retrieve secret message [1].
The objective of this paper is to analyze the records on different texture synthesis techniques for steganography. The remaining paper is categorized as: section 2 focuses on different techniques of steganographic texture synthesis. Section 3 gives summary of various steganographic techniques. Finally section 4 gives conclusions.

II. TECHNIQUES OF STEGANOGRAPHY USING TEXTURE SYNTHESIS

There are several methods by which steganographic texture synthesis can be designed. We have reviewed eight different methods of steganography using texture synthesis.

2.1 Texture Synthesis by Nonparametric sampling

Texture synthesis is proposed by using non-parametric method. Algorithm grows texture, pixel by pixel outwards from an initial seed. A single pixel P as unit of synthesis chosen so that model capture as much high frequency information as possible. For each new context, the sample image is queried and the distribution of P is constructed as histogram of all possible values that occurred in the sample image [2].

2.2 Image Quilting for texture Synthesis and Transfer

In this method synthesized image is obtained by stitching number of small patches of already available image. This process is called as image quilting. It is simple and fast texture synthesis method, which gives good result for different textures.in this go through the image to be synthesized in raster scan order in steps of one block. For every

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location, search the input texture for a set of blocks that satisfy the overlap constraints (above and left) within some error tolerance. The randomly pick one such block. Compute the error surface between the newly chosen block and the old blocks at the overlap region. Then find the minimum cost path along this surface and make the boundary of the new block. Paste the block into the texture. Repeat the process till the image converges [3].

2.3 Real time Texture Synthesis By Patch-Based sampling

In this method texture patch is randomly selected from input sample texture. The process proceeds by pasting patch in the lower left corner of image. Set K=1. Forming set of all texture patches from input sample texture such that its boundary zone matches to output textured image. Acceleration schemes can be applied to increase the speed of execution. This technique is applicable to constraint and unconstraint texture synthesis [4].

2.4Wang Tiles for image and texture Generation

In this the set of wang tiles generated. The primary advantage of wang tiles is once the tiles are filled large expanses of non-periodic texture can be created very efficiently. In this method a large square sample images obtained randomly from source image. The sample is fitted to already create image by optimizing a cutting path in an overlapping region [5].

2.5 Data-Embeddable Texture Synthesis

It is smart technique for generating repetitive texture patterns through feature learning of sample image. This method selects the component that is insensitive to human vision system; the selected component must have high contrast for giving the robustness against noisy transmission. The total information is embedded in all extracted LBP codes. Therefore arbitrary data is divided and embedded by painting the pattern of LBP in to each block in their sequence. A texture image is coated so as to conceal this painted pattern [6].

2.6 Feature Aligned Shape Texturing

This technique if fully automatic and based on salient curves on surface for constraint vector filed generation and feature to feature texture optimization. This requires a vector field that determines the local orientation of textures in 2D & 3D. Then synthesize texture patterns guided by the field, which is achieved in an optimization -based framework. After optimization to enforce exact alignment patch-matching paradigm done [7].

2.7 Histogram-shifting-based Reversible Data Hiding

This method gives high capacity and low distortion. By the framework divide host image in to non-overlapping blocks such that each block contains n pixels. Then n dimensional histogram is generated by counting the frequency of the pixel-value-array sized n of divided block. Finally, data embedding is implemented by modifying the resulting n-dimensional histogram [8].

2.8 Steganography Using Reversible Texture Synthesis

This technique can synthesize arbitrary size of texture image and embedding capacity of secret message is proportional the size of texture image. It is secure as it resists RS steganalysis attack [9]. Also in reversible process it recovers the source texture as well as secrete message. This method firstly creates source patches from source texture. Secondly it generates index table to record the location of source patch.

Then it creates composition image by pasting source patches on workbench. By using message oriented texture synthesis process secrete message is embedded and we get final stego synthetic texture. The embedding capacity is given by the total embeddable patches and capacity in bits per patch. The message extraction also involves generating the index table and retrieves the source texture.

III. SUMMARY OF DIFFERENT STEGANOGRAPHIC TECHNIQUE

The results of different steganographic technique are shown in Table 1

References	Advantages	Disadvantages
[2]	Simple in design	For some textures produce verbatim copies of the original.

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[3]	Simple and fast	Easily able to detect image.
[4]	0.02 sec fast& High quality method	The Boundary zone width required to be large to avoid mismatching features across patch boundaries. It is also more costly to construct.
[5]	30fps data embedding	Visible artifacts may remain. Large set of tiles required to tile the space non periodically.
[6]	Smart technique for generating repetitive texture patterns	The embedded data cannot be perfectly detected but additionally error correction techniques required.
[7]	fast and robust detection, texturing performed fully automatically	Corner singularities appear to have less visual impact compared to flat region.
[8]	Combines various techniques to ensure the reversibility and lossless compressibility of natural images.	Some HS based algorithms based on adaptive embedding and the location –map free methods cannot be derived by this method.
[9]	Offers embedding capacity proportional to the size of the stego texture image. Securing capability is undefeatable Allows recovery of the source textures.	The mirror operation over the image boundary is flawed and is easy to attack.

IV. CONCLUSION

The review of various different steganography using texture synthesis has been presented in this paper and finally concluded that with the advancement in technology there would always be expanding requirement of the efficient system in respect to the concealing of image with tradeoffs between simplicity, performance and data embedding capacity. The various techniques offer substantial benefits and provide an opportunity to extend steganographic applications. Steganography using reversible texture synthesis is useful for high data embedding capacity and security against steganalysis attack.

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