# Reversible Texture Synthesis for Steganography

Snehal A Natekar[1], Mrs.Rane C.V.[2]

[1]*PG Scholar, Department of Electronics and Telecommunication, JSPM's RSCOE, Savitribai Phule Pune University, Maharashtra, India.*

[2]*Professor, Department of Electronics and Telecommunication, JSPM's RSCOE, Savitribai Phule Pune University, Maharashtra, India.*

[1]natekarsnehal20@gmail.com

[2] ranecharushilav@gmail.com

***Abstract***— *Steganography is technique of concealing important messages or information within other host medium. It aims to hide secrete message from third party. For achieving the goal it embeds a secrete message or data or information into host medium. The paper deals with method known Reversible Texture Synthesis for Steganography. In this the texture synthesis method resamples any smaller texture image to synthesizes a new texture image having arbitrary size and with local similar appearance. The texture synthesis process is embedded into steganography so as to hide secrete information. In comparison to traditional data hiding process, the technique being used here conceals source image and embeds secrete information or message by applying texture synthesis process. This information can be retrieved by using reversible texture synthesis and can get protected against eavesdropping and other attacks. Any steganalytic algorithm is unable to beat this steganographic technique. The technique provides with various embedding capabilities and can produce valid texture images which are recoverable to retrieve original source texture.*

***Keywords*** *— Data embedding, reversible,Stego image, patch, steganography, texture synthesis.*

## I. INTRODUCTION

Steganography is a technique used to hide confidential information in other non important data part or file. steganography for digital media[2].To conceal any secrete message steganography helps to embed it into host media to protect from eavesdropping and other attacks. In this method the used host media can be Digital image, audio,video, text, 3D model, etc. There are large numbers of steganographic algorithms available for use of digital images, but all these make use of existing image as a cover medium, hiding texts within web pages, using ciphers etc. This method lead to disadvantage as the size of cover media is fixed, the more secrete messages embedded allow more distortion of image. Also using cover image may lead to disclosing secret message when steganalysis is used to detect secret message in stego image. Hence their needs compromise among image quality and embedding capacity as the fixed cover image limits the capacity. Instead of making use of existing method to hide messages, the paper deals with the technique to conceal texture images and perform secret message embedding by using texture synthesis process. Texture synthesis process hides messages into number of infinite patches. The paper proposes a novel Reversible texture synthesis approach for steganography. In this the texture synthesis method resamples any smaller texture image to synthesizes a new texture image having arbitrary size and with local similar appearance. The process allows the extraction of source texture and secrete embedded message from a stego synthetic texture. The approach presents the reversibility of texture synthesis which provides the recovery of source texture; also any steganalytic algorithm is not able to decrypt this steganographic approach as stego texture image is formed from source texture instead of modifying existing image.This paper is organized as follow : Related work are discussed in section II, section III presents the proposed system, experiments and results are shown in section IV, section V concludes the paper.

## II. RELATED WORK

Z.Ni,Y.-Q.Shi,N.Ansri and W.Suin [3], proposes image reversible data hiding algorithm which facilitate the recovery of cover image leading to no distortion of it from stego image after being extracted from concealed data.

X.Li, B.Li, B.Yang and T.Zeng [4], proposes an approach of histogram shifting for reversible image data hiding as it is capable of controlling modification of pixels and limits the distortion embedding. The technique reduces the

extra overhead by making use of small sized location map.

H.Otori and S.Kuriyama [5],the paper proposed method of combination of data codes with pixel based synthesis texture.But the method faced disadvantage of message extraction small error rate. The technique encodes the secret message in color dot pattern and printing it on blank image. The remaining pixels are filled by using pixel-based synthesis texture so as to hide existing dot pattern. This encoded data can be decrypted by photograph of stego texture image.

C.Han,E.Risser,R.Ramamurti and Grinspun [6], presents pixel based algorithm. The method does pixel by pixel synthesis and makes use of spatial neighborhood comparison to select most identical pixel as output in sample texture. Wrong pixel synthesis results in propagation error as every output pixel is identified by existing synthesized pixels.

M.F.Cohen ,J.Shade,S.Hiller and O.Deussen [7] proposes Patch-based algorithms. In this method instead of using pixels patches are posted from a source texture to synthesize textures. The method needs to assure that the neighboring patch should match the pasted patch.

A.Efros and W.T.Freemam [8] presents "image quilting."It is a patch stitching method which synthesizes and stitches every new patch.

## III.PROPOSED SYSTEM

Reversible texture synthesis for steganography is used for concealing secret messages in texture images. The method uses patch as basic unit in texture synthesis for steganography.This method is combination of steganography and texture synthesis process for concealing secret messages and source texture. The proposed system consist of main two approaches as shown in fig.1 and fig.2.

### *A. Message Embedding Procedure*

It consist of three processes for embedding message as :

#### *1) Index Table Generation Process:*

An index table is created to record the location of the source patch set in the synthetic texture. The index table allows the access of synthetic texture and helps embedding style reveals one of the major benefits our proposed system.

#### *2) Patch Composition Process:*

In this step, source patches are pasted in the workbench to create combination of image. Initially a blank image is selected as workbench having size equal to synthesis texture. The source patches are stored into the workbench by referring to source patch ID stored in index table created in above process.

#### *3) Message Oriented Texture Synthesis Process:*

Final Stego synthesis texture is created to embed secret message via the message-oriented texture synthesis. The algorithm selects appropriate patches according to secret messages and produces much different synthetic texture. Capacity Determination is related to the capacity in bits that can be concealed at each patch i.e.BPP (bits per patch) and to the number of embedded patches in stego synthetic texture.

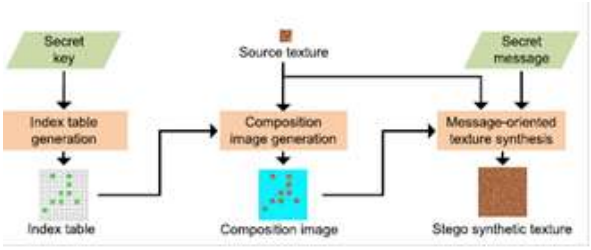



Fig. 1 Procedure of Message Embedding [1]

### *B. Message Extraction Procedure*

At receiver side extraction of message is performed which consists index table generation, retrieving source texture, performing texture synthesis, extracting and authenticating the secret message embedded in stego synthetic texture. The final step is the message extraction and authentication step.

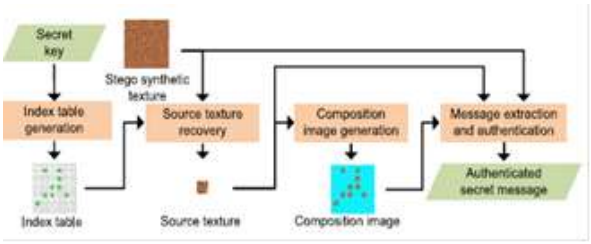


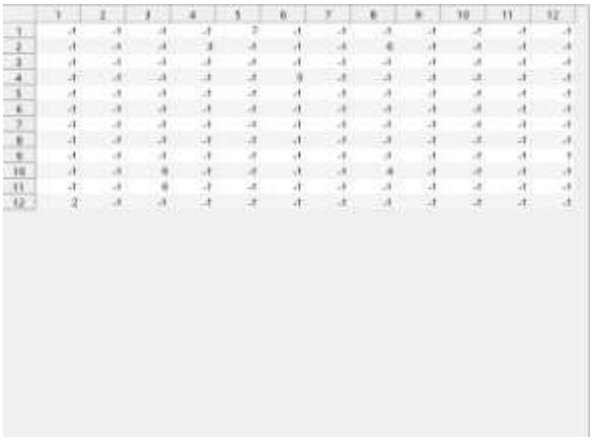

Fig. 2 Procedure of Message Extraction [1]

## IV. RESULTS

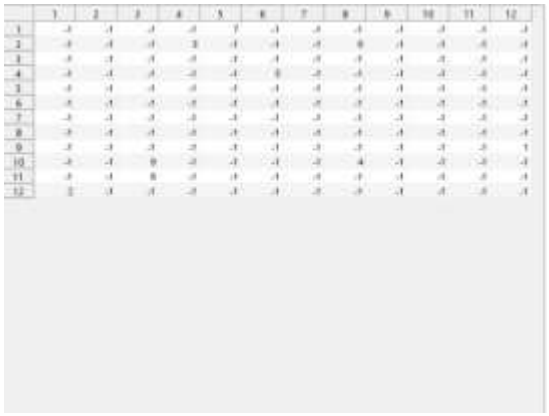
Experimental results have verified that the proposed algorithm can produce visually plausible texture images, provide various numbers of embedding capacities, and recover the source texture.

Source Texture

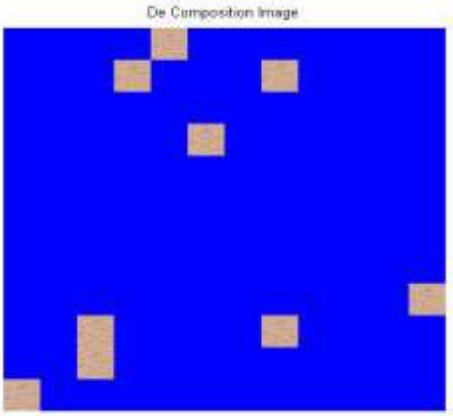
Index table at extraction side



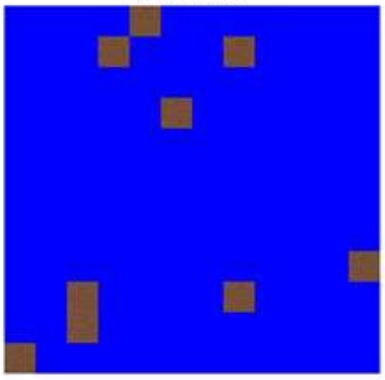
Index table at message embedding side



Decomposition image




Composition Image



Source Texture Recovery

Stego Synthetic Texture

In this way source texture and secrete message can get retrieved by use of visual cryptography. It provides privacy from intruders.

## IV. CONCLUSION

The paper proposes reversible texture synthesis for steganography to ensure security and privacy of secret messages avoiding any suspected eavesdropping. The patch based method used provides reversible way to retrieve the secret message and also source textures. With the help of secret key at first index table is generated. Index table contains position at which texture patches are

introduced. Then composition image is generated in which source patches are pasted according to index table. Future objective is to extend the method for other types of texture synthesis approach and improve image quality. Also two or more steganographic methods can be combined so as to increase embedding capabilities.


## ACKNOWLEDGMENT

I would like to thank all people who help me in different way. Especially, I am thankful to my guides Dr. Apte S. D. and Prof. Mrs. Rane C. V. for their continuous support and guidance in my work.


## REFERENCES


**[1].** KUO-CHEN WU & CHUNG-MING WANG, "STEGANOGRAPHY USING REVERSIBLE TEXTURE SYNTHESIS,"IEEE TRANS.IMAGE PROCESS, VOL 24, NO1JUN 2015.

[2]. N. F. JOHNSON AND S. JAJODIA, "EXPLORING STEGANOGRAPHY: SEEING THE UNSEEN," COMPUTER, VOL. 31, NO. 2, PP. 26–34, 1998.

[3]. Z. Ni, Y.-Q. Shi, N. Ansari, and W. Su, "Reversible data hiding," IEEE Trans. Circuits Syst. Video Technol., vol. 16, no. 3, pp. 354–362, Mar. 2006.

[4]. X. Li, B. Li, B. Yang, and T. Zeng, "General framework to histogram- shifting-based reversible data hiding," IEEE Trans. Image Process., vol. 22, no. 6, pp. 2181–2191, Jun. 2013

[5]. H. Otori and S. Kuriyama, "Data-embeddable texture synthesis," in Proc.8th Int. Symp.Smart Graph., Kyoto, Japan, 2007, pp. 146–157.

[6]. C. Han, E. Risser, R. Ramamoorthi, and E. Grinspun, "Multiscale texture synthesis," ACM Trans. Graph., vol. 27, no. 3, 2008, Art. ID 51.

[7]. M. F. Cohen, J. Shade, S. Hiller, and O. Deussen, "Wang tiles for image and texture generation," ACM Trans. Graph., vol. 22, no. 3, pp. 287–294,2003.

[8]. A. A. Efros and W. T. Freeman,"Image quilting for texture synthesis and transfer," in Proc. 28th Annu. Conf. Comput. Graph. Interact. Techn.,2001, pp. 341–346.