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# DIGITAL IMAGE HIDING USING TRANSFORMATION TECHNIQUES

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***Abstract***

***This paper presents about image hiding techniques are watermarking, stegnography and curvelet transform. The techniques are used to hide the image Firstly, apply the curvelet transform to original image to change the resolution of the given image; Secondly, apply the histogram technique is for a graphical representation of original image. Transform to the original image and the open image, gaining their curvelet coefficients. Thirdly, interpolate their curvelet coefficients; finally, reconstruct the image by using Inverse curvelet Transform, to get the resultant image. Simulation results show that this approach is easy to use and provides best strategy for image hiding. This technique makes use of curvelet transform which represents the latest research result on multi-resolution analysis. It converts the image into curvelet transform numerical representation and then the vice-versa operation is made to get the original image.***

***Keywords: Curvelet Transform, Arnold Transform, Fusion, Watermarking, Stegnography .***

## INTRODUCTION

Embedding images into other images has applications in data hiding and digital watermarking. During the last few years, much progress has been made in developing watermarking techniques that are robust to signal processing operations, such as compression [1].Image encryption schemes have been increasingly studied to meet the demand for real-time secure image transmission over the Internet and through wireless networks. Traditional image encryption algorithm such as data encryption standard has the weakness of low-level efficiency when the image is large.

The advantage of steganography, over cryptography alone, is that messages do not attract attention to themselves. Plainly visible encrypted messages are not unbreakable.These requirements of a good steganographic algorithm will be discussed below. In watermarking all of the instances of an object are “marked” in the same way. The kind of information hidden in objects when using watermarking is usually a signature to signify origin or ownership for the purpose of copyright protection

## IMAGE ANALYSIS

### A. Watermarking

There are two main techniques for watermarking your images. One is the visible method, used by iWatermark, where you superimpose your logo or signature onto your image.

The second is designed to be invisible, and is used by companies such as Digimark. Hidden throughout the

picture, within the code that generates it, is a recognizable pattern that identifies it as being your artwork.

This technique is usually far more expensive and has two major drawbacks. It almost always reduces the quality of the picture, and it may encourage people to copy your work because it does not appear to be copyrighted. In both cases, a skilled graphic designer intent on using your image, can find ways to remove your watermark at a cost to the quality of the image.

Here the watermarking technique is used for information hiding in the Image without any noisy on it and also without change the accuracy and size, height of the image.Analyze the image height , width size and resolution of the image .Calculate aboved details to find the accuracy information the image for image Hiding.

For Example, the user want to identify the image using curvelet transform the image will be easily retrieved to the conversion of graphical representation to digital image

### *B. Steganography*

Steganography is the technique of hidden communication. Using steganography a secret message is embedded in a medium, such as an image or a sound clip and sent. The existence of the hidden message is not known except by the sender and receiver. It conceals the fact that the message exists by hiding the actual message in another.

In this technique, the whole document is hidden to beside of the image .First the image is converted into the binary format like encryption. And the image is retrieved from the binary format like decryption. While decrypting the original image and actual document is retrieved.

### *C. Curvelet Transform*

The Curvelet transform is a higher dimensional generalization of the Wavelet transform designed to represent images at different scales and different angles. It is a new multiscale representation most suitable for objects with curves. Unlike the wavelet transform, it has directional parameters, and the curvelet pyramid contains elements with a very high degree of directional specicity.

In addition, the curvelet transform is based on a certain anisotropic scaling principle which is quite different from the isotropic scaling of wavelets. The elements obey a special scaling law, where the length of the support of a frame elements and the width of the support are linked by the relation width, length.

The digital curvelet transform is implemented using the fast discrete curvelet transform. Basically, it is computed in the spectral domain to employ the advantage of FFT. Given an image, both the image and the curvelet are transformed into Fourier domain, then the convolution of the curvelet with the image in spatial domain becomes the product in Fourier domain. Finally the curvelet coefficients are obtained by applying inverse Fourier transform on the spectral product.

But due to the frequency response of a curvelet is a non-rectangular wedge; the wedge needs to be wrapped into a rectangle to perform the inverse Fourier transform. The wrapping is done by periodic tiling of the spectrum using the wedge, and then collecting the rectangular coefficient area in the center. Through this periodic tiling, the rectangular region collects the wedges corresponding

portions from the surrounding periodic wedges

## IMPLEMENTATION

### A. Arnold Transform method

Arnold transform is chosen as pre-treatment method for open image as it is simple and periodic. Arnold transform is a kind of transform in the traversing theory, called as Arnold's cat mapping.

Arnold transformation is defined as:

{ xn+1 = (xn + Yn) mod t

Yn+l = (xn + 2Yn) mod t

Due to the Arnold transform periodicity, the original image can be recovered.

### *B. Curvelet Transform method*

The curvelet transform is used to hide the image. The Curvelet transform is a higher dimensional generalization of the Wavelet transform designed to represent images at different scales and different angles. Curvelets enjoy two unique mathematical properties, namely, Curved singularities can be well approximated with very few coefficients and in a non-adaptive manner - hence the name "curvelets." Curvelets remain coherent waveforms under the action of the wave equation in a smooth medium. The following steps are used to perform the image hiding.

### *C. Resume Algorithm*

The resume algorithm is used to retrieve the original image by using the curvelet coefficients. Fig.2 shows the steps to retrieve the original image.

This algorithm starts with the input image and the curvelet coefficients. The image is processed and by using Inverse Curvelet transform method and get the resuming image. The Arnold transform is applied to reconstruct the image.

## EXPRIMENTAL RESULT

The system is developed in Microsoft Visual Studio 2005 on core to dual PC. The size of the image database is 1000. In order to search more efficiently and quickly, a searching table is constructed. It maintains the image details like image taken height, width, coefficients, size etc.

Fig.3 shows how the image is processed by curvelet transform to the original image. First step the Arnold transform to the image to interpolate the curvelet coefficients. All the methods are applied this transform for getting the encrypted image. Finally, the resuming algorithm gives the original image is recovered.

Fig.4 shows the range of curvelet coefficients for describing vertical, horizontal, diagonal values of hidden and original images.

The histogram plots the number of pixels in the image (vertical axis) with a particular brightness value (horizontal axis). Algorithms in the digital editor allow the user to visually adjust the brightness value of each pixel and to dynamically display the results as adjustments are made. Improvements in picture brightness and contrast can thus be obtained.

## CONCLUSION

This paper has proposed approach that retrieves the image using several hiding techniques like watermarking, cryptography, Arnold transform through curvelet transform. After we are checking all those methods to get a good image hiding technique through using curvelet transform. For scaling operation to measure the height, width, size of the user image. This process is done through segmentation and classification is applied.

We conduct several experiments to evaluate the performance of this system. This provides results of the best image hiding technique to be hide and retrieve required image to the receiver.

The image is processed by using transformation techniques to the original image. The Arnold transformation to the image is made to interpolate the curvelet coefficients. the transformation techniques are applied to get the encrypted image.

The graphical results obtained on the transformation; from the technique for transformation applied the curvelet transform shows the best method for image hiding.

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**Step 1.** Input original image, open image a and the times of iteration times;

**Step 2.** Apply Arnold transform to original image ORI, and gain the image 0 RI A

**Step 3.** Apply curvelet Transform to the image ORIA and the open image 0 PI, gaining their curvelet coefficients;

**Step 4.** Interpolating curvelet coefficient gained through by using fusion parameter a; go to step2 until times;

**Step 5.** Reconstruct the image by using Inverse curvelet Transform, and thus get the result image RI.

**Fig.1.Algorithm for Curvelet Transform**

**Step 1.** Input end image, open image a, t and the times of iteration;

**Step 2.** Apply Discrete Curvelet Transform to the end image E I and the open image 0PI , gaining the Curvelet coefficient of the original image and the Curvelet coefficient of the open image OPI;

**Step 3**.Interpoiating curvelet coefficient gained throng step3 by using fusion parameter a. goes to step2 until times;

**Step 4**.Reconstruct the image by using Inverse Curvelet Transform, and thus get the Resuming image RIA

**Step 5**. Apply inverse Arnold transform to the image RIA, and gain Resuming image RI

**Fig.2. Resume Algorithm**

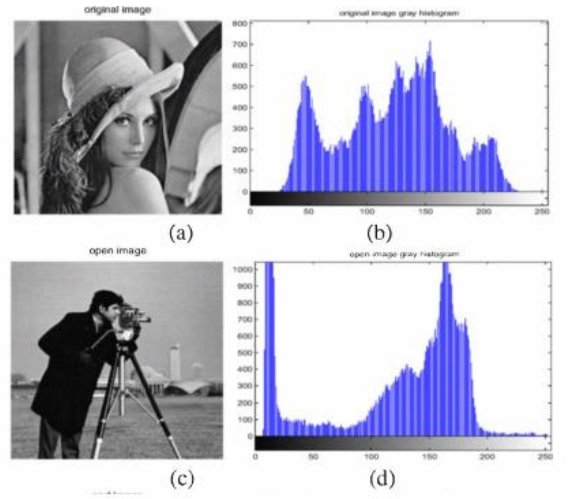


Fig. 3.Image Hiding

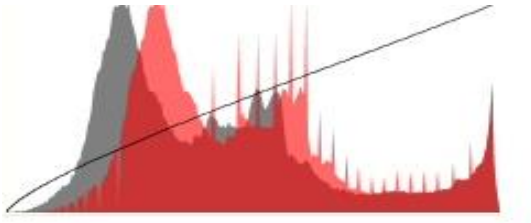

**Fig4. Graphical Representation of Histogram**

Tab.1. Correlation coefficients of two adjacent pixels in two images

| | original image | hiding image |
|---|---|---|
| Horizontal | 0.9782 | 0.00083 |
| Vertical | 0.9736 | 0.00072 |
| Diagonal | 0.9657 | 0.00069 |

**Fig.4.Coefficeient table**