



Implementing LSB on Image Watermarking Using Text and Image

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Abstract: With the rapid development and wide use of Internet, information transmission faces a big challenge of security. Steganography, cryptography hashing and access control are different techniques which are used for database security. Watermarking is one of the accurate techniques for data security. Watermarking used in different fields like images, audio, video, text. Image is used for image security. There are different existing methods which are used for image watermarking with LSB algorithm. In this method Image watermarking using LSB algorithm is based on two different parameters Standard deviation and Mean. Image watermarking can be hidden in two ways, either text is used for secret message or image is used for secret image. After selecting the information hiding message, it uses LSB algorithm and hides the information on high result value of these parameters.

Keywords: Entropy, LSB, Mean, Standard Deviation, Watermarking.

I. INTRODUCTION

In the last years, due to the advancement in technologies and the increase rapidly of data transmission, most people prefers to use the internet as the essential medium to transfer data. The data transmission is made very simple, fast and accurate using the internet. However, the protection and enforcement of intellectual property copyrights has become an important issue in the digital world [1]. There are different Techniques which are used for Security of data. Cryptography, hashing, access control. Watermarking is one of the techniques which are used for copy right protection.

Digital watermarking is a technique which allows an individual to add hidden copyright notices or other verification messages to digital audio, video, or image signals and documents. Such hidden message is a group of bits describing information pertaining to the signal or to the author of the signal (name, place, etc.). The technique takes its name from watermarking of paper or money as a security measure. A digital watermark is a digital signal or pattern inserted into a digital image. Since this signal or

pattern is present in each unaltered copy of the original image, the digital watermark may also serve as a digital signature for the copies. A given watermark may be unique to each copy, or be common to multiple copies. LSB (Least Significant Bit) is one of the existing methods used to watermark an image as it is simple and accurate. In a digital image, information can be inserted directly into every bit of image information or the more busy areas of an image can be calculated so as to hide such messages in less perceptible parts of an image.

To hide data in the spatial domain of images two possibilities are there; first based on the pixel value and second based on transform or frequency modification. LSB is based on pixel value modification and is simple to understand, easy to implement and results in stegno images that contain hidden data yet appear to be of high visual fidelity. If the attacker tries to change the LSB values in any of the sections then the watermark is still intact as it put the watermark throughout the image.

II PROPOSED METHODOLOGY

Image Watermarking has been used in different techniques to hide the secret image like DCT, DFT, DWT and others. Image Watermarking can be implemented through LSB. In this research both the text and the image is watermarked using existing LSB approach and the results are analyzed by using different parameters of the image which are then used to place the watermark in the original image.

Least Significant Bit (LSB) Technique

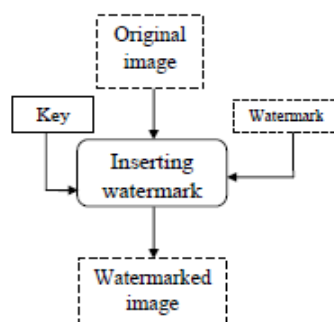


Fig 1 Watermarking Process



The LSB technique works by replacing some of the information in a given pixel with information from the data in the image. While it is possible to embed data into an image on any bit-plane, LSB embedding is performed on the least significant bit(s). This minimizes the variation in colours that the embedding creates

Image Parameters Used In Watermarking Image watermarking using different parameters and existing parameters used in Image watermarking are Histogram Rotation, Pixel Intensity [2, 3]

In proposed research some parameters are considered which are as following: Standard Deviation Mean Existing Entropy Calculate for Comparative Analysis

Standard Deviation: It calculates the contrast of the image.

Standard Deviation:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$$

If standard deviation is high than the high contrast part of an image is shown otherwise it shows the low contrast part of an image. **MEAN** Mean calculate the brightness of the image.

$$mean = \frac{\sum X}{N}$$

If mean is high than image is bright otherwise it is dark

ENTROPY

Entropy calculates the random values of an Image.

Advantages of Proposed Methodology

- As LSB Watermarking is based on pixel values; the process is simple to follow and uses binary values of the image to hide the secret image.
- It results in High PSNR (Peak signal to noise ratio) which helps the data from loss.
- It leads to Low MSE (Mean square error) which helps the image from degradation.
- Most of the existing techniques watermark the image using another cover image. The proposed method also incorporates text as secret data.

III EXPERIMENTAL RESULTS

To test the performance of the proposed algorithm, we configured the test conditions; as cover image and secret image, standard image such as Lena and university logo. The experiment shows the following results:

$$H(X) = - \sum_{i=1}^n p(x_i) \log p(x_i).$$

High

entropy shows the high randomness in image.

Low Entropy show high similar values. Zero entropy show the same values of the image.

Steps Followed in the Proposed Method

Proposed LSB (Least significant Bit) algorithm selects an image as Cover Image. Then it selects the secret information either it can be Text or an Image. After selecting both cover and message information it calculates the set parameters (Standard Deviation or Mean). Then it finds the highest value and uses it to hide the information in the LSB (Least Significant Bit) of an image. PSNR (Peak signal to noise ratio) and MSE (Mean square error) is calculated to compare the results with the existing approaches. The steps followed in LSB Image Watermarking of text and image is listed in as follows:

Steps:

1. Select cover Image.
2. Select information type for secret data.
 - a. Text
 - b. Image
3. Covert image pixels into binary values.
4. Calculate following parameters of the image:
 - a. Standard Deviation
 - b. Mean
5. Hide the information using the parameter that result in high value.
6. Repeat the steps until image or text is hidden in the image.
7. In order to compare the result with existing LSB calculate PSNR and MSE



| Cover Image | Secret Image |
|---|---|
|  |  |
| http://www.cs.cmu.edu/~chuck/lennapp/ | http://academictimes.in/universities/private-2/sri-guru-granth-sahib-world-university/ |

Table 1 Cover Image and Secret Image Using in Different Paramete

Hiding Image with Cover Image Using Standard Deviation

Standard Deviation Calculate the contrast of an image Standard Deviation high if contrast High.



| Bit Positions | PSNR | MSE |
|---------------|-------|-------|
| 1 | 66.70 | 0.03 |
| 2 | 62.54 | 0.01 |
| 3 | 59.88 | 0.24 |
| 4 | 51.22 | 1.59 |
| 5 | 42.34 | 3.4 |
| 6 | 24.58 | 8.8 |
| 7 | 36.66 | 14.25 |
| 8 | 31.73 | 48.96 |

Table 2 Results calculated values of PSNR and MSE on Different Bit Position

| Bit Positions | PSNR | MSE |
|---------------|-------|--------|
| 1 | 64.40 | 0.02 |
| 2 | 57.34 | 0.11 |
| 3 | 51.21 | 0.47 |
| 4 | 45.67 | 1.89 |
| 5 | 39.39 | 7.47 |
| 6 | 33.24 | 30.78 |
| 7 | 27.42 | 117.60 |
| 8 | 21.08 | 430.36 |

Table 4 Results calculated values of PSNR and MSE on Different Bit Position



Table 3 Showing Lena Image on different Bit Positions Using Standard Deviation



Table 5 Results of Lena Image in Different Bit Positions

CONCLUSION: In this table there are different values on different bits first is LSB where result is highest and watermarked image has no effect. On 8th bit or MSB result is degrade and watermarked image has distortion.

Hiding Image with Cover Image Using Mean
 Mean calculates the brightness of an image, Mean high in bright image and low in in dark image.

CONCLUSION: In mean there are different result in different bit positions which are shown above. LSB has accurate image in result after watermarking and MSB has distortion in the result image.

Hiding Image with Cover Image Using Entropy

In this section It shows the result on high entropy. Entropy is an existing method and at the end we compare it with other two parameters. The table is as following:

| Bit Positions | PSNR | MSE |
|---------------|-------|------|
| 1 | 62.14 | 0.03 |
| 2 | 60.21 | 1.11 |
| 3 | 52.48 | 4.47 |
| 4 | 45.56 | 6.89 |

| | | |
|---|-------|--------|
| 5 | 37.96 | 10.47 |
| 6 | 32.06 | 40.78 |
| 7 | 25.64 | 163.60 |
| 8 | 19.54 | 730.36 |

Table 6 Results calculated values of PSNR and MSE on Different Bit Position

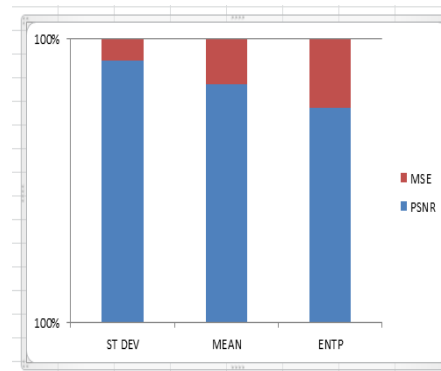


Table 7 Results of Lena Image on Different Bit Positions Using Entropy

CONCLUSION: Entropy is exiting block based method. This method compare entropy with standard deviation and mean . Standard deviation and mean increase the PSNR and Low the MSE value of an image which prove the improved result.

Comparative Analysis of Existing Image Parameter(Entropy) with Proposed Image Parameters(Standard Deviation and Mean)

In this section it compares the entropy result with standard deviation and mean results and prove the improved result.



Graph 1 Comparison Of Different Image Parameters (Standard Deviation, Mean and Entropy)

Hiding Text with Cover Image Using Standard deviation

In this section text is used as secret message hide in image. Text can be string or word. Text gives the more accurate results.

| Bit Positions | PSNR | MSE |
|---------------|-------|-------|
| 1 | 85.72 | 1.01 |
| 2 | 80.28 | 1.00 |
| 3 | 73.35 | 0.01 |
| 4 | 67.20 | 0.03 |
| 5 | 61.50 | 0.04 |
| 6 | 55.08 | 0.17 |
| 7 | 42.33 | 3.98 |
| 8 | 36.32 | 14.56 |



Table 8 Results calculated values of PSNR and MSE on Different Bit Positions

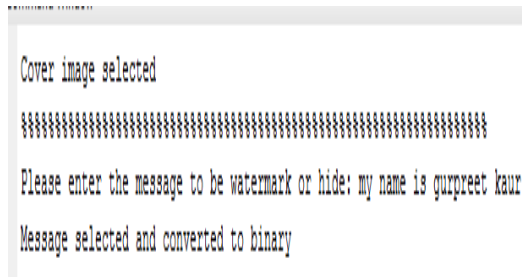


Fig 2 coding of text hiding with Standard deviation

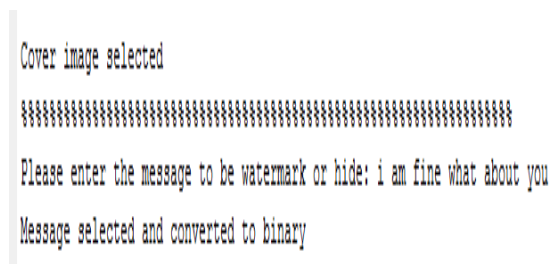


Fig 3 coding of text hiding with Mean

Hiding Text with Cover Image using Mean

In this section text is hiding into image with mean value. The result table of these values is shown as following:

| Bit Positions | PSNR | MSE |
|---------------|-------|-------|
| 1 | 78.18 | 0.044 |
| 2 | 71.23 | 0.07 |
| 3 | 69.55 | 0.09 |
| 4 | 61.98 | 0.18 |
| 5 | 54.16 | 0.25 |
| 6 | 50.91 | 2.81 |
| 7 | 47.67 | 7.80 |
| 8 | 36.07 | 16.41 |

Table 9 Results calculated values of PSNR and MSE on Different Bit Positions