



Locating Secret Images Using DWT Techniques and RSA Algorithm

Sneha, Jyoti

M.Tech Scholar, Dept. of CSE, Technological Institute of Textile & Sciences, Bhiwani, Haryana, India

Asst. Professor, Dept. of IT, Technological Institute of Textile & Sciences, Bhiwani, Haryana, India

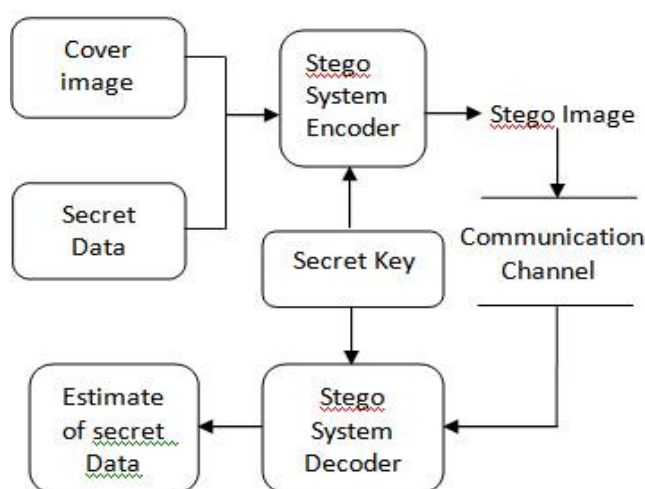
ABSTRACT: Steganography is the science that involves communicating secret data in an appropriate multimedia carrier like image, video and audio files. It does not replace cryptography but rather boosts the security using its obscurity features. When we work on a network the security requirements of a user as well as a network increases. There are number of available ways over the network to achieve the information security. Till now the available methods hide the secret data over the image on a fixed pattern that makes a user identify the pattern easily. We are providing a dynamic pattern extraction approach using biometric. It advocates an object oriented approach in which skin to be detected areas in the image are selected for embedding where possible. After detecting the skin area, edge detection is performed by using the canny edge detection method. As the edges will be detected we will use this area as the pattern to hide the data over the image. The secret data is compressed using the DWT technique and then further compressed secret information is encrypted using RSA algorithm with bit shift method. This proposed technique provides more security to the data as data is embedded not in the whole image but only at some specified location. Due to this image distortion of the carrier image is less and it is difficult to identify the Secret image.

KEYWORDS: secret data, rsa, edge detection, DWT

I. INTRODUCTION

A. Steganography

The word Steganography is originally derived from Greek words which mean "Covered Writing". Steganography is a technique that embedding the secret information into another image so that unknown user cannot identify that secret information. Steganography is the skills of writing secret messages in such a way that no one, other than the sender and receiver, suspects the survival of the message, a form of security through obscurity



Stego-system



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B. Cryptography

Cryptography is the science of using mathematics to encrypt and decrypt data. The word cryptography is derived from the Greek word kryptos, meaning 'hidden'. Cryptography enables us to store sensitive information or transmit it across insecure networks (like the Internet) so that it cannot be read by anyone except the intended recipient.

II. PROPOSED ALGORITHM

- Step 1: Cover image is loaded & skin color detection is performed for the biometric image.
- Step 2: Apply canny edge detector algorithm for the biometric image.
- Step 3: Once the edges of cover image are found then load the secret image.
- Step 4: After loading the secret image, DWT technique is applied to compress the secret image as compressed image will less distort the cover image.
- Step 5: Then RSA encryption algorithm with bit shift method is performed.

- Step 6: Encrypted message is then embed behind the cover image.
- Step 7: Stego image with better quality is obtained.

III. RSA ALGORITHM WITH BIT SHIFT METHOD

There are various steps to implement RSA algorithm:

- ❖ 1. Choose two large prime numbers p, q randomly.
- ❖ 2. Compute $n = pq$.
- ❖ 3. Calculate $\phi(n)$ as follow:
$$\phi(n) = (p-1)(q-1)$$
- ❖ 4. Choose an integer e such that e is relatively prime to $\phi(n)$.
$$1 < e < \phi(n)$$

such that
$$\gcd(\phi(n), e) = 1$$
- ❖ 5. Determine $d, 1 < d < \phi$, such that
$$d = e^{-1}(\text{mod}(\phi(n)))$$

- ❖ 6. Encryption:
$$\begin{array}{ll} \text{Plaintext} & M < n \\ \text{Ciphertext} & C = M^e \text{ mod } n \end{array}$$
- ❖ 7. After the encryption bit shift method is used where left four bits of a byte are XOR with the right four bits and resultant bits are set at the place of right 4 bits.
- ❖ 8. Decryption:
$$\begin{array}{ll} \text{Ciphertext} & C \\ \text{Plaintext} & M = C^d \text{ mod } n \end{array}$$

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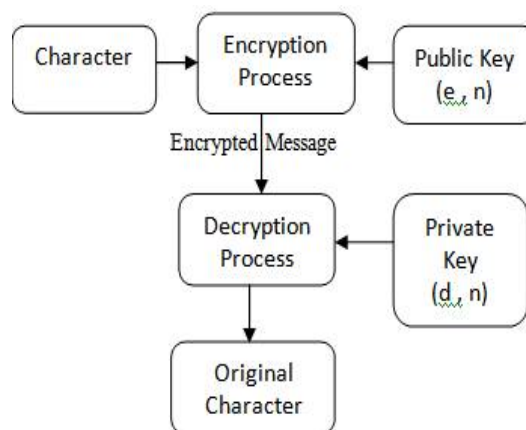
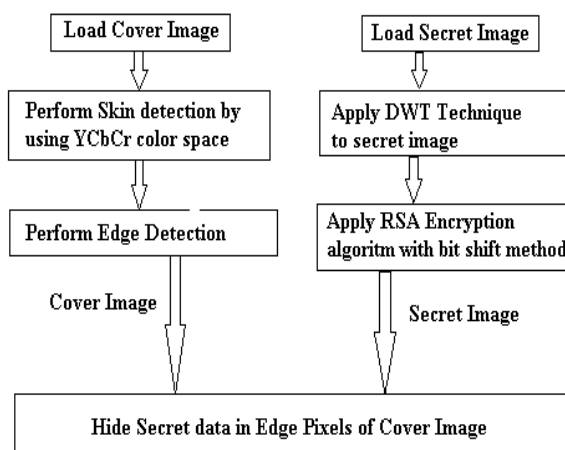


Fig: RSA message

IV. FLOWCHART



The flowchart shows that first the cover image is loaded and then skin tone detection is done when the cover image is biometric and if the image is non-biometric then edge detection algorithm is applied. After that the secret image is loaded and DWT method is applied to it which will give compressed secret image. Then this image is encrypted by using the RSA with bit shift method. Encrypted image is then embed into the edge pixels of the cover image. This method of data hiding is more secure as secret image only uses the edge pixels and data is not dispersed in the whole cover image. As distortion of cover image is less and then the image quality of stego image is good.

V. RESULTS AND ANALYSIS

- The results are analyzed based on PSNR (Peak Signal to Noise Ratio) value and MSE (Mean Square Error).

$$PSNR=10.\log_{10}(\frac{MAX_i^2}{MSE})=20.\log_{10}(\frac{MAX_i}{\sqrt{MSE}})$$

- DWT algorithm and RSA algorithm with bit shift method was implemented and executed using MATLAB 7.0.4. The cover and stego images are compared on the basis of MSE and PSNR. PSNR and MSE are the most commonly used metrics for measuring the quality of stego image. The experimental results convey that this technique provides sufficiently good PSNR value.

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- **YCbCr Color Space Images**

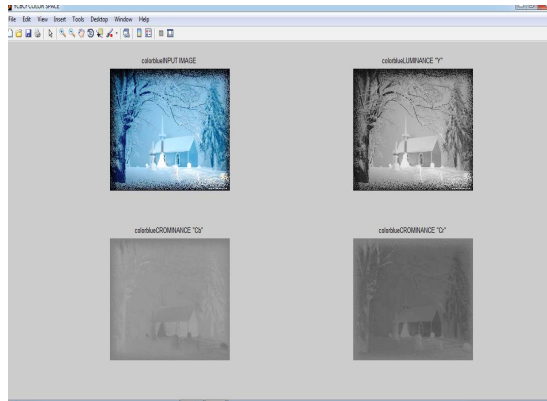


Figure1

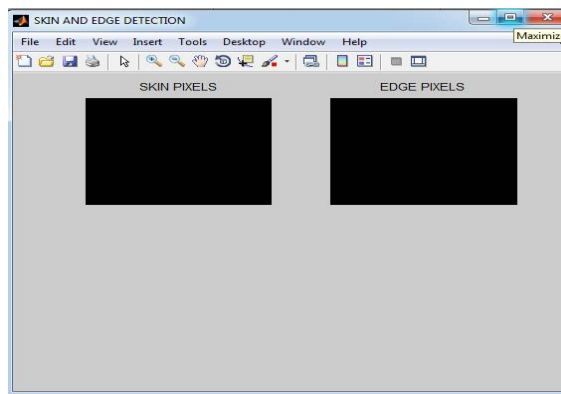
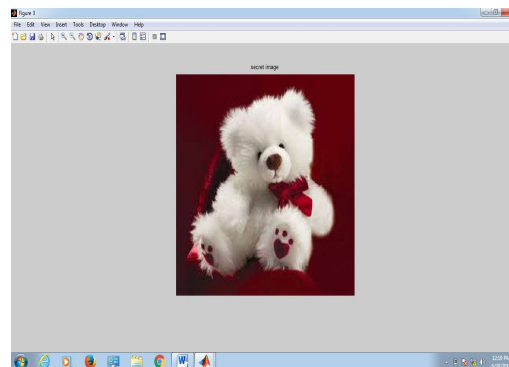


Figure2

Explanation..

Figure 1 and Figure 2 represents YCbCr Color Space Images and Skin detection and Edge detection of the Cover Image. As first the cover image is loaded and then skin pixels are evaluated. After the Evaluation of skin pixels, edge detection algorithm is performed by using the canny method as this method hide the secret data only in the edge pixels which provide more security.

- **Secret Image which is hide behind the Cover image**



- **Decomposition by DWT**

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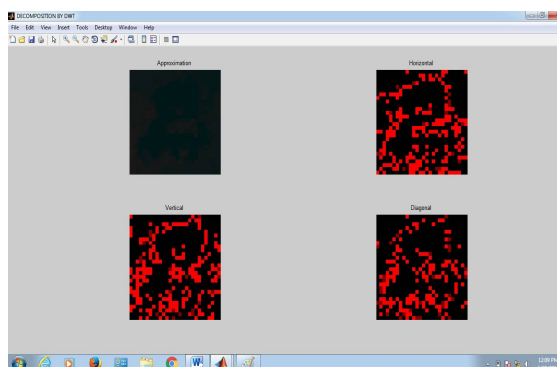
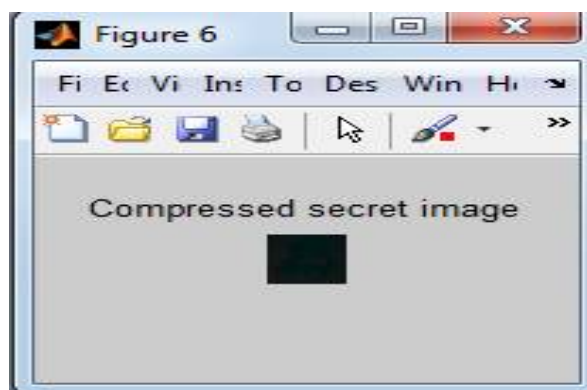
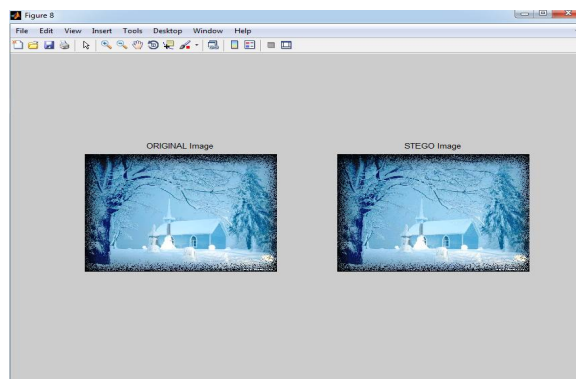


Figure 3 and Figure 4 represents Secret Image which is hide behind the Cover image and Decomposition of secret image by DWT method. After performing the edge detection, the secret image is loaded and DWT technique is applied at the secret image.

- **Compressed secret image**



- **Original image And stego image**



Obtained values of the parameters are:

PSNR= +33.667 dB

Time Taken = 2.953



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VI. CONCLUSION

As Steganography is concerned with security purpose and it is considered as a fascinating scientific area. The proposed algorithm pre-processes the data before hiding it behind the cover image. The compression step involved in the algorithm reduces the size of text and thus allows more data to be hidden behind the same image. So, using compression more data can be hidden behind the same image. The skin area and the edge pixels are evaluated and secret data which is encrypted with RSA algorithm is embedded into specific area. As data is embedded in certain region rather than whole image so security as well as quality of stego image is enhanced. The data is hidden only in the edge pixels of cover image which is least imperceptible to human eye thus providing a higher PSNR value and no visual distortion of image quality. Moreover, the size of the image does not change after hiding the text in it.

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