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Skin Tone Image Steganography using IWT

Sonali K. Powar[1] and H.T.Dinde[2]

[1]*Assistant Professor, Modern College Ganeshkhind Pune (M. S.) INDIA*

[2]I/C Principal *Karmaveer Bhaurao Patil College, Urun-Islmapur (M.S.) INDIA*

Abstract --- Now a day's internet becomes part of our life. It is way to communicate globally so large amount of data is transferred through internet. Data security is very important when we transmit data on internet and steganography is used to achieve this. Steganography is art of hiding data in another file, image, audio, video. In this paper datais in skin tone region of image. Skin tone is detected using YCbCr (Yellow, Chromatic blue, Chromatic red). Frequency domain approach is used to hide data. Skin tone region is cropped and blue panel is extracted from cropped region (Integer Wavelet Transform) is applied only onblue panel of cropped skin tone area. Finally, data hidden in least significant bit of high frequency (HH and HL) sub-bands.Cropping skin tone area act as key so provides more security. Result of this method is analyzed using mean square error (MSE) and Peak Signal Noise Ratio (PSNR). This method gives good PNSR value.

Keyword: Image Steganography, Skin-tone, IWT, Biometric, Cropping

IINTRODUCTION

Steganography is an art of hiding data in another file, image or video. If data is hidden in other medium it will not attract intruder's attention so it is more secure way to hide data. The medium in which data is going to hide is called carrier. Depend on type of carrier there are four types of steganography- text steganography, image steganography, audio steganography and video steganography. In this paper image steganography is used. Figure 1 shows the process of image steganography.

Figure 1 Image Steganography process

There are two approaches in image steganography

A. ***Special Domain:*** In this approach data is directly embed in pixel value. "Least significant bit substitution method provides image quality of stego-image is improved with low extra computational complexity" [2]. There are number of special domain algorithm like Direct Least Significant Bit substitution, Optimal Pixel Adjustment Procedure (OPAP), Pixel Indicator Technique (PIT), Pixel Value Differencing, SLSB.

B. ***Frequency Domain:***In this approach image is transformed into frequency domain and data is embed into it. Most commonly used frequency domain transformations are DCT, DWT, IWT.

Embedding data only in specific region provides more security. "If we embed data after cropping no one can extract data with out value of cropped region but without cropping preserves histogram of DWT coefficient after embedding also and preventshistogram-based attacks" [1]. Embedding data in high frequency bandsprovides more security since it is less sensitive to human eyes[14][13]. Rather than performing ordinary LSB steganography random steganography give good PNSR values [15]. "The F5 algorithm was proposed as a steganographic technique that allows higher capacity of embedding and better security at the same time" [10].

II PROPOSED METHOD

In proposed method data is embed in skin tone region of cover image. Human eye is not much sensitive to Skin tone region and also preserves hidden data after cropping also because intruder will not crop face region as it is main part of image. This method take advantage of these things and data is securely embed in skin tone area. In this method first skin tone region is detected by converting image into YCbCr color space. After detecting skin pixel, we will get binary image with skin pixels as '1' and non-skin pixel as '0'. Detect large area from this binary image which contains large number of skin pixel. According to position of that area, rectangle area is cropped from cover image which act as key value at receiver

side. Then extract blue panel from this cropped region. Cropped region (only blue panel) has to be preprocessed before applying IWT (Integer Wavelet Transformation). If pixel values are 255 make it 254 because if we add 1 in 255 it become 0 (range of pixel value is 0 to 255). If we not preprocessed image data is not retrieved properly. After pre-processing apply IWT on blue panel of cropped region to get LL, LH, HL, HH sub bands. Data is embedded in least significant bit (LSB) of HH and HL sub-bands. Then inverse IWT is applied on blue panel of cropped area. Lastly Merge this cropped area in cover image to get final Stego Image. At the time of extraction skin tone region is detected form using key. Extract blue panel form cropped region and then apply IWT on it. Lastly data is extracted form HH and HL sub bands.

Skin Tone Detection

To detect skin tone region RGB image is converted into YCbCr (Yellow, Chromatic blue, Chromatic red) color space using following formula

cb = 0.148* R - 0.291* G + 0.439 * B + 128;

cr = 0.439 * R - 0.368 * G -0.071 * B + 128;

To create binary image the pixel whose values lies between following range make it '1' and '0' otherwise.

140<=cr&&cr<=165 && 140<=cb&&cb<=195

IWT (Integer wavelet transformation)

IWT is used to convert image into frequency domain. When IWT is applied on image it creates four sub bands

LL (Horizontally and Vertically Low Pass)

LH (Horizontally Low Pass and Vertically High Pass)

HL (Horizontally High Pass and Vertically Low Pass)

HH (Horizontally and Vertically High Pass)

LL sub band is more sensitive to human eyes so data can be hidden in LH, HL, HH sub bands. I have chosen HL and HH band to hide data.

III ENCODING(Hiding data in image)

Algorithm to hide data in image:

Step 1: Select Cover image M X N and detect skin tone region.

Step 2: Crop Skin tone area from cover Image as Mc X Nc which work as key at receiver side.

Step 3: Extract Blue panel of cropped area (Mc X Nc) and apply IWT on blue panel to get four sub-bands as LL LH HL HH

Step 4: Hide data in least significant bit of HH HL sub-bands

Step 5: Apply iIWT (inverse IWT) on blue panel of cropped area.

Step 6. Marge cropped area in cover image M X N to get final stego image

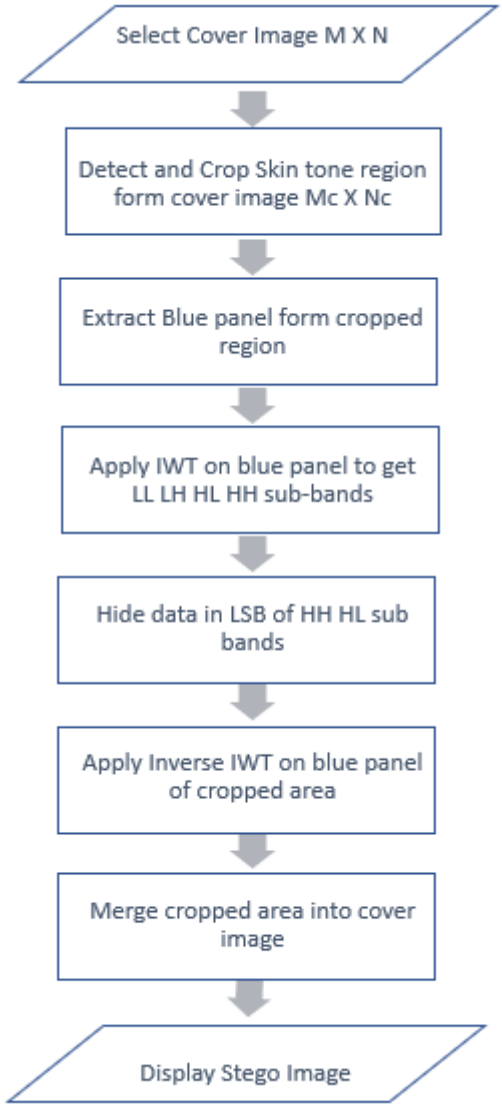
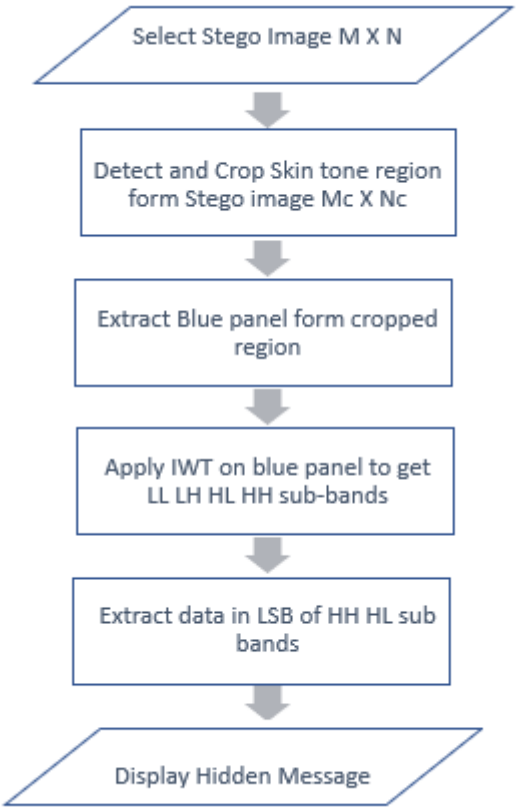


Figure 2 Flowchart of encoding process

Figure 2 shows flowchart to hide data in image using IWT transformation.

IV. DECODING (Extracting data from image)



Algorithm to extract data from image:

Step 1: Select Stego image and crop skin tone using key.

Step 2: Extract Blue panel of cropped area (Mc X Nc) and apply IWT on blue panel.

Step 3: Extract data from least significant bit of HH HL sub-bands

Figure 3 Flowchart of decoding process

Figure 3 shows flowchart to extract hidden data from image using proposed method.

V. PERFORMANCE MEASURE OF PROPOSED METHOD

Performance of image steganography technique is measure with different parameters. I have used PSNR and MSE are parameters used for performance measure. Following formula is used to calculate MSE and PNSR value.

$$MSE = \frac{\sum_{M,N} [I_1(m,n) - I_2(m,n)]^2}{M * N}$$

$$PSNR = 10 \log_{10}\left(\frac{R^2}{MSE}\right)$$

M and N is number of rows and columns of input image. I1 is original image and I2 is Steno image. Calculate square of difference between pixel values of I1 and I2, take sum of that difference and divide it by total number of pixels in image.

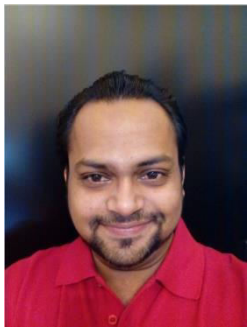
In PNSR R is maximum possible value of pixel. In our case it is 255. Acceptable range of PNSR is 40 db to 80 db

Following table shows MSE and PNSR values calculated using proposed method

Table 1: MSE and PNSR values calculated using proposed method

Image	Size of cover Image	Size of Data	MSE	PNSR
Image 1	176 KB	7.14 KB	0.0077483	69.2388
Image 2	29.0 KB	7.14 KB	0.050212	61.1227
Image 3	17.2 MB	7.14 KB	0.00087384	78.7165

(a) Cover Image (b) Skin Tone detection



(c) Stego-Image

Figure 4 a) Cover image b) Skin tone area c) Stego Image

Figure 4 a) shows the cover image. Figure 4 b) shows the result of skin tone detection algorithm. Figure 4 c) shows the resultant image after hidden data.

VI. CONCLUSION

In this method data is hidden in frequency domain of skin tone region so it resists to visual attack. Data is embedded in face so it is resists against cropping and rotation because face is main part of image. Particular area is cropped form skin tone region which act as key at receiver side which provides more security. If good quality image and image which contains more skin tone region is used as cover, we got good payload capacity and also good PNSR values.

REFERENCES:

[1] Anjali A. Shejul, Umesh L. Kulkarni, "A Secure Skin Tone based Steganography Using Wavelet Transform", International Journal of Computer Theory and Engineering, Vol.3, No.1, pp. 16-22, February, 2011.

[2] Chi-Kwong Chan, L.M. Cheng, "Hiding data in images by simple LSBsubstitution", Pattern Recognition, Vol.37, pp. 469-474, 2010.

[3] R. Amritharajan, R. Akila, P. Deepikachowdavarapu, "A Comparative Analysis of Image Steganography",
International Journal of Computer Applications, Vol. 2, No.3, pp. 41-47, 2010.

[4] M. F. Tolba, M. A. Ghonemy, I. A. Taha and A. S. Khalifa, "Using integer wavelet transformation in colored image-steganography", International Journal of Intelligent Computing and Information Sciences (IJICIS), Vol 4 No., July 2004.

[5] RupaMaan, LovneeshBansal, "Comparison and Implementation of Biometric inspired digital steganography", JCST (International Journal of Computer Science and Techenology), vol 3, issue 4, oct-dec 2012

[6] K. SathishShet, Nagaveni and A. R. Aswath , "Image Steganography using Integer wavelet transformation based on color space approach",

[7] N. Provos, P. Honeyman, "Hide and seek: an introduction to steganography", IEEE Security and Privacy, 1(3) (2003)32–44.

[8] A. Cheddad, J. Condell, K. Curran and P. McKevitt, "Digital Image Steganography: Survey and Analyses of Current Methods ", Signal Processing, Volume 90, Issue 3, Pages 727-752, March 2010.

[9] Jessica Fridrich, MiroslavGoljan, DorinHogea, "Attacking the OutGuess", Proc. of 2002 ACM Workshop on Multimedia and Security, ACM Press, pp. 3-6, 2002.

[10] A. Westfeld, "F5-A Steganographic Algorithm: High capacity despite better steganalysis," Proc. 4th International Workshop on Information Hiding., 2001, vol. 2137, pp. 289-302, Springer, 2001.

[11] K S. Babu, K B Raja, U. M. Rao, Rashmi K A, Venugopal K R, L M Patnaik, "Robust and High Capacity Image Steganography using SVD", IET-UK International Conference on Information and Communication Technology in Electrical Sciences, 2007, pp. 718-723.

[12] Abbas Cheddad, Joan Condell, Kevin Curran, Paul McKevitt, "Biometric inspired digital image steganography", 15th Annual IEEE International Conference and Workshop on the Engineering of Computer Based System.

[13] VemulaHarini, JeevanKishor G., "Skin Tone Based Secrete Data Hinding in Image Using Wavelet Transform", International Journal of Computer Application Technology and Research Vol2-issue 6,666-670,2013, ISSN:2319-8656

[14] DipikaNehete, AnantBhide, "Skin Tone Based Secret Data Hiding in Images", International Journal of Current Engineering and Technology ISSN 2277-4106.

[15] Ashita K, Smitha Vas P, "Randomized Steganography in Skin Tone Images", International Journal of Computer Science, Engineering and Information Technology (IJCSEIT), Vol 8, No 2/3, June 2018.