International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

DWT Based Image Steganography using Neural Network

Rashmeet Kaur[1]& Er.Rajat Tiwari[2]

M.tech student, Deptt of ECE; Chandigarh University, Gharuan, Mohali, Punjab, India[1]
Assistant professor, Deptt of ECE; Chandigarh University, Gharuan, Mohali, Punjab, India[2]
email[1]: rashmeet92@yahoo.in

Abstract:
Numerous data security calculations have been created consolidating encryption and steganography calculations to improve data security. A standout amongst the latest calculations is the NEURAL NETWORK. A NN based steganography that enhances the security level of secret message. The Neural Network is trained using several training images in which the images first provided to wavelet transformation and the transformed image provided to back propagation neural network and the hidden layers is identify the bits where the data can be embedded. Once the data position is identified, the data can be installed. The PSNR of the stego picture was assessed to quantify the stego pictures quality. The occupied results exhibited that utilizing mystery key gives great security and PSNR esteem higher than previous image steganography strategies. Similarly, DWT has been used to embedding and extraction process of secret message. So in proposed work, neural network with DWT will be introduced.

Keywords: Image Processing; Steganography; Neural Network; DWT

I. INTRODUCTION

Digital image processing refers to the processing of digital images by using digital computers. Image processing enhances the image features of our own interest and attenuates the irrelevant components, such as noise component [1]. The main goal of image and video processing is to get the useful data or information, for an observer, of the scene. It is very hard job to impart capable for extract, gather and interpret all the useful visual data to the machine. So it is a great need to understand the ways of storing, processing, transmitting, recognizing and interpreting of such visual scenes.The step by step advancement in the correspondence frameworks requests the abnormal state of data security in correspondence systems. As the transmission of data is increments on the web so arrange security is getting exceptionally significance. Consequently the classifiedness and the unwavering quality of the information must be shielded from unapproved access. It implies there must be a touchy improvement in the field of data security alongside the copyrights of the advanced media. For the security of emit data cryptography and steganography are the two usually utilized security apparatuses. Secrecy, availability and uprightness are the three principle ideas of data security. Feelings of the diverse individuals who make the utilization of such data are verification, approval and non-revocation. Steganography are the security apparatuses accessible for the insurance of the mystery data[7]. Previously many approaches has come into existence like LSB, Seed values, DCT etc [8, 9, and 10]. But each approach has its own advantages as well as disadvantages. So in the proposed work two techniques will be merged to enhance the MSE and PSNR value of images to get the accuracy at high rate [11].

Remaining paper is organized as: Section 2 describes the proposed work methods, Section 3 describes the proposed work model, Section 4 describes the Algorithm used for embedding as well as extraction, and Section 5 contains the

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

result section. Finally Section 6 contains the future scope and conclusion.

II. STEGANOGRAPHY METHOD

The proposed method embeds the message in DWT based on Neural Network. This section describes the proposed method agorithm, embedding and extracting algorithms in detail.

A. Discrete Wavelet Transform

The discrete wavelet transform is associate degree awfully valuable suggests that for signal examination and picture process, mainly in multi-determination demonstration and will crumble signal within totally distinctive components. 1-D discrete wavelet change (1-D DWT) breaks down associate degree data into 2 elements (the normal part and the point of interest segment). 2-D discrete wavelet change (2-D DWT) breaks down associate degree data into 4 sub-groups, one normal part (LL) and 3 detail element components (LH, HL, HH) DWT of signal is measured by going it through a sequel of filters[12] To start samples are gone through a low pass channel with impulse response bringing about a convolution of 2:

$$Y[n] = (x*g)[n] = \sum_{k=-\infty}^{\infty} \mathbf{x[k]g[n-k]} \quad (1)$$

The signal is additionally deteriorated together with high-pass channel. The yields giving the detail element coefficients (from the high-pass channel) and close estimation coefficients (from the low-pass). It is critical that the two channels are identified with one another. Then again, since a large portion of the frequencies of the signal have now been ejected, a large portion of the specimens can be neglected by Nyquist's rule. The channel yields are then sub sampled by 2

$$y_{low}[n] = \sum_{k=-\infty}^{\infty} x[k]h[2n-k] \quad (2)$$

$$y_{high}[n] = \sum_{k=-\infty}^{\infty} x[k]g[2n-k] \quad (3)$$

This disintegration has divided the time determination since just half of every channel yield describes the signal.

B. NEURAL NETWORK

ANN is a numerical model that simulates the design and practical aspects of natural neural system. In alternative words it is a copying of natural neural framework. ANN mimics some options of a true nervous system that contains an assortment of basic computing units referred to as neurons. ANN consists of an interconnected cluster of artificial neurons and processes data employing a connectionist approach for computation. A synthetic purposeful model of the biological vegetative cell includes 3 basic parts. Initial the neurotransmitters of the natural nerve cell are modelled as weights. [13] The colligation of the natural nerve cell combines the neural system and provides the quality of the association. For a synthetic neural, the load is a variety, and speaks to the colligation. A -ve weight relects an repressive association, whereas positive qualities assign excitant associations. Each input is summed collectively and changed by the weights. Finally, an initiation operates controls the abundancy of the yield. As an illustration, a appropriate vary of yield is regularly somewhere around zero and one, or it may be -1 and one.

Feed forward networks carries with it a progression of layers:

- The primary layer includes a affiliation from system data.
- Every succeeding layer includes a affiliation from past layer.
- The ultimate layer creates the system's yield.

The weights from every neuron in layer l - 1 to the neurons in layer l are masterminded into a lattice w_l. Every segment relates to a neuron in l - 1, and every line compares to a neuron in l. The input signal from l - 1 to l is the vector x_l. If ρ_l is a vector of actuation functions [σ1 σ2 … σn] that follows up on every row of data and b_l is a arbitrary offset vector then the aggregate yield of layer l is given as: [14]

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org

$Y_l=\rho_l(w_l x_l+b_l)$
(4)
Two layers of yield can be measured by substituting the yield from the first layer into the input of the second layer:
$Y_l=\rho_l(w_l\rho_{l-1}(w_{l-1}x_{l-1}+b_{l-1})+b_l)$
(5)
This technique can be kept on figuring the yield of a system with an arbitrary number of layers.

III. GENERAL FRAMEWORK

Steps of Proposed work are divided into two sub-steps i.e. embedding algorithm and extraction algorithm [11].

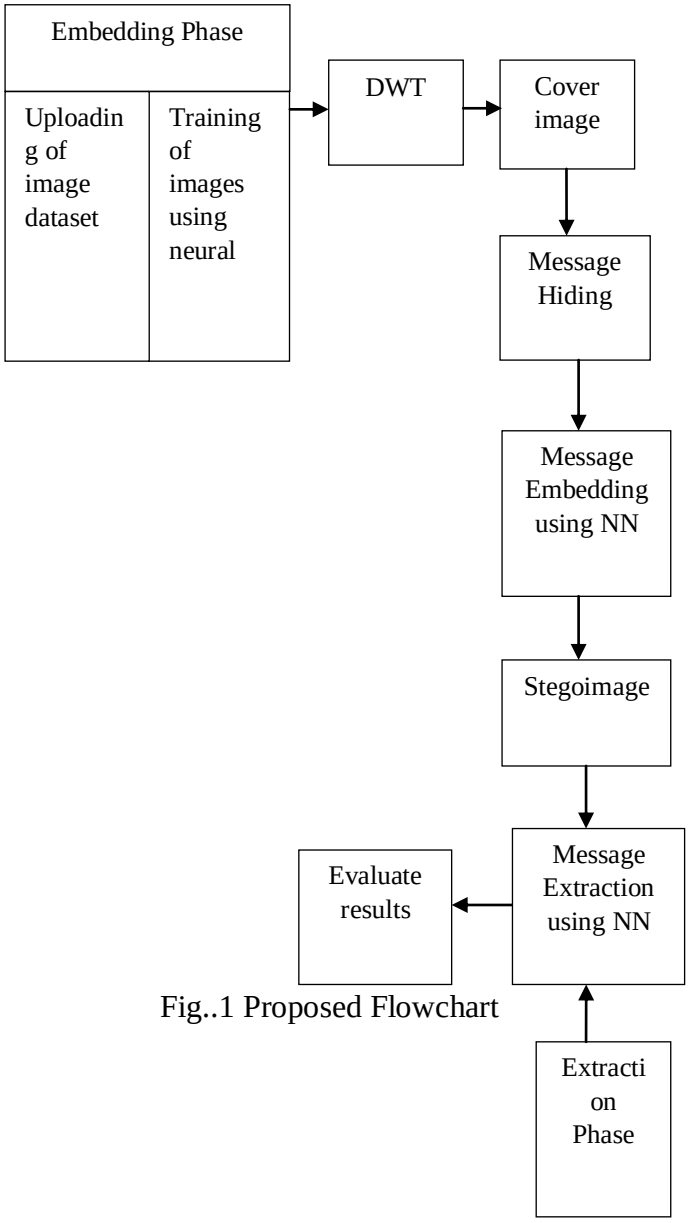


Fig..1 Proposed Flowchart

IV. ALGORITHM

Embedding Algorithm/ Training Phase

- Upload images for training further that will be used as cover and stego images.
- Neural network used for training of images in steganography.
- DWT Lower set training
- DWT Upper set training
- Get Cover image
- Select hidden message for embedding.
- Get Stego Image
- Embed Using NN.

Extraction Algorithm/ Testing Phase

- Get Stego Image
- Extract hidden message using Neural Network (NN)
- Evaluate parameters using MSE, PSNR and time computation.

V. RESULT AND IMPLEMENTATION

The whole simulation has been taken place in MATLAB 7.10 using three parameters i.e [8].

PSNR: The Peak Signal-to-Noise Ratio (PSNR) is defined as:

PSNR=10*log (255*2/MSE) (6)

MSE: The mean-squared error (MSE) between two images I1 (m,n) and I2(m,n) is

$$MSE = \frac{1}{mn} \sum \sum [(I,j) - K (I,j)]^2$$ (7)

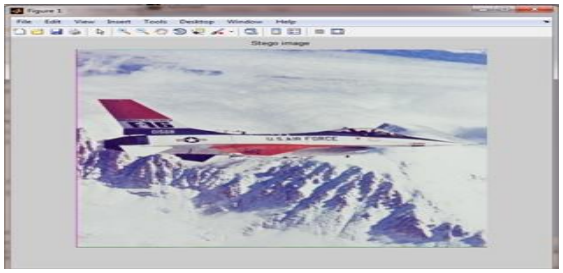
Where m and n are the number of rows and columns in the input images, respectively.

Hiding Capacity: It is rate of hiding volume of message that can be hidden in an image.

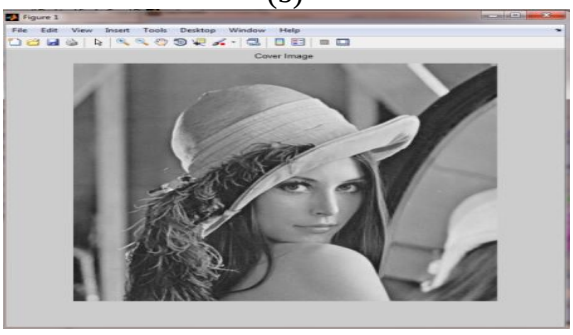
Figure 2 shows the original cover images and stego images and shows that there is no significant change in stego image .

(a)

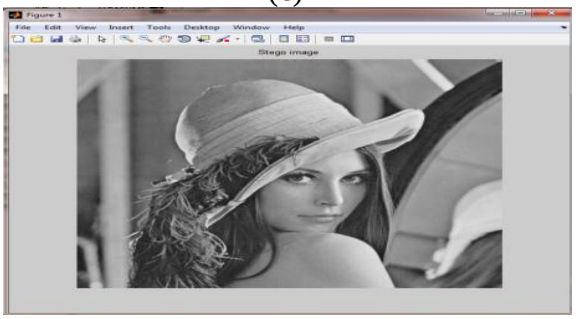
International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 10, October 2015
Available at http://internationaljournalofresearch.org



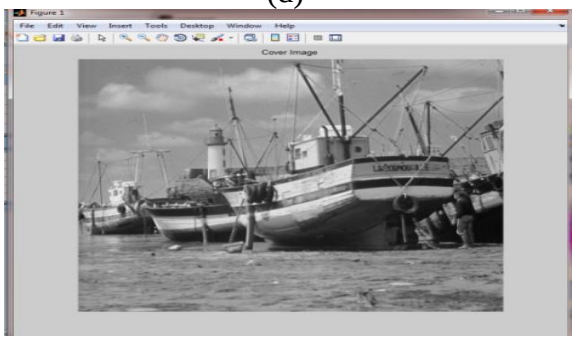
(b)



(c)

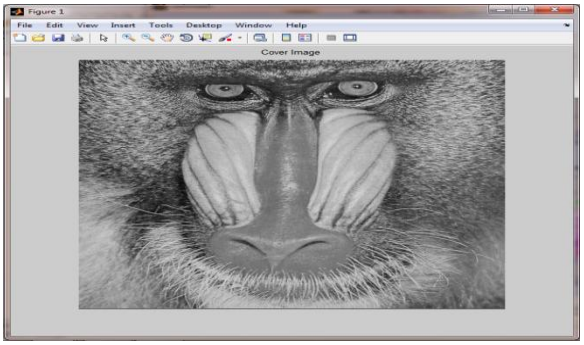


(d)

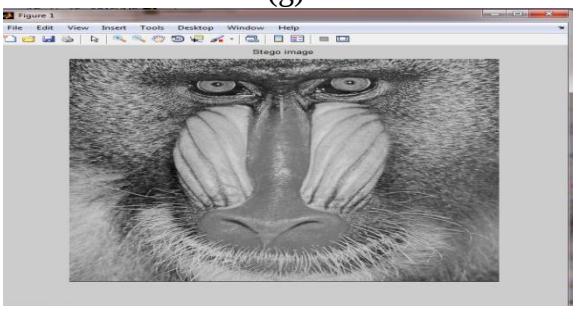


(e)

(f)



(g)



(h)

Fig.2. Four cover images and their corresponding stego images (a)cover image Jet (b) stego image Jet (c) cover image Lena (d) stego image Lena (e) cover image Boat (f) stego image Boat histogram (g) cover image Baboon (h) stego image Baboon

The following table shows the comparison of Hiding capacity and PSNR of the images (Jet, Lena, Boat, Baboon) between DWT + NN (proposed method) and DWT + GA (previous method) and shows that proposed method have improves Hiding capacity, and PSNR.

Table.1 Performance Values

Cover Image	Method	Hiding Capacity (bit)	PSNR
Jet	DWT + NN (proposed)	8226049	48.76
	DWT + GA (previous)	3029333	28.74
Lena	DWT + NN (proposed)	8247333	48.75
	DWT + GA (previous)	1509628	29.74
Boat	DWT + NN (proposed)	9568645	48.96

	DWT + GA (previous)	1349290	29.69
Baboon	DWT + NN (proposed)	8247333	48.75
	DWT + GA (previous)	1325765	28.61

VI. CONCLUSION AND FUTURE SCOPE

The planned system has mentioned implementation of firmly using steganographic technique supported NN and DWT formula. It is concluded that once traditional image security using steganographic system is connected, it can make the assignment of the agents impracticable to decode the encoded mystery note. The protection options of the steganographic are exceptionally advanced utilizing seed values formula. This analysis work has been implemented to boost the image steganography technique in order that the standard of the image remains a similar. To implement our objective, we've used Neural Network and DWT. We tend to overall concluded that managing the pixels to a deeper level will increase the capability of the image to cover certain messages. Neural Network has been found effective enough to search out pixels to merge the information bits while not much effective the initial pattern of the image. From the results it has been concluded that neural network achieves good leads to information concealing in terms of PSNR and MSE values.
In future, this method is applied to computer forensic pictures. So the system will generate extremely undetectable secret shares using certain set of coaching information which could be automatically generated and is disposed when the task has been performed.

REFERENCES

[1] Nain, V. and Bansal, N. 2014. "Performance Upgradation of a Transform Domain based Steganography using Neural Logics," International Journal of Advanced Research in Computer Science & Technology (IJARCST 2014), 2 (1), PP. 150-153.

[2] Kumar, S. and Multoo, S. 2011. "Steganography based on contourlet Transform," International Journal of Computer Science and Information Security (IJCSIS), 9 (6), PP. 215-220. |

[3] Kumar, K. S., Raja, K. B., &Pattnaik, S. 2011. "Hybrid domain in LSB steganography," International Journal of Computer Applications. 19 (7). Pp. 35-40.

[4] Kumar, K. S., Raja, K. B., Chhotaray, R. K. and Pattnaik, S. 2011. "Performance comparison of robust steganography based on multiple transformation techniques," International Journal of Computer Technology and Applications, 2 (4). PP. 1035-1047.

[5] Mandal, J. K. 2011. "A Frequency Domain Steganography using Z Transform (FDSZT)," International Workshop on Embedded Computing and Communication System (IWECC 2011), pp.1-4.

[6] Singh, S. and Siddiqui, T. J. 2012. " A security enhanced robust steganography algorithm for data hiding," International Journal of Computer Science Issues (IJCSI), 9 (3). PP 131-139.

[7] Bhattacharya, T., Dey, N. and Chaudhuri, S. R. 2012. "A session based multiple image hiding technique using DWT and DCT," International Journal of Computer Applications, 38(5). pp. 18–21.

[8] Mahajan, R. &Kranthi, B. 2014. "An Improved Image Steganography Technique Using Discrete Wavelet Transform," International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS), 9 (1), PP. 76-82.

[9] Naoum, R., Viktorov, O., Shihab, A., and Shaker, M. 2013. "Image-to-image Steganography Based on Discrete Cosine Transform," European Journal of Scientific Research, 106 (4), PP. 512-522.

[10] Naoum, R. 2011. "Lecture Notes, Artificial Neural Network," Middle East University (MEU), Jordan.

[11] Naoum, R. S., Abid, N. A., & Al-Sultani, Z. N. 2012. "An Enhanced Resilient Backpropagation Artificial Neural Network for Intrusion Detection System," International sJournal of Computer Science and Network Security IJCSNS, 12(3)

[12] Barnali Gupta Banik, "A DWT Method for Image Steganography", International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, pp. 983-989, 2013.

[13]http://www.fon.hum.uva.nl/praat/manual/Feedforward_neural_networks_1__What_is_a_feedforward_ne.html.

[14]https://en.wikibooks.org/wiki/Artificial_Neural_Networks/Feed-Forward_Networks

[15] Dawson-Howe, Kenneth M, "Techniques for surveillance video enhancement." Department of Computer Science, Trinity College, Dublin, 1995.

BIOGRAPHY

Rashmeet Kaur was born in Kharar (punjab). She has completed her B.Tech in Electronics and Communication Engineering from Shaheed Udham Singh Women Engineering College, Mohali (Punjab) in 2013 and presently doing M.Tech from Chandigarh University, Gharuan, Mohali (Punjab). Her research interest area is Image Processing, Signal Processing and Wireless Communication