



**RESEARCH ARTICLE**

# A Neural Network Based Dynamic Masking Approach to Improve Watermarking

Dinesh Kumar

Student, M.Tech, Deptt. Of Computer Sc. & App., GJUS & T, Hissar, Haryana Ph.NO-9467701988

[Dineshsarowa112@gmail.com](mailto:Dineshsarowa112@gmail.com)

*Abstract- To provide the effective information transmission, one of the effective approach is watermarking approach. In this work, a dynamic mask based approach is defined for information storage. The presented watermarking model is defined as a two stage model. In first stage of this model, the neural network approach is applied to generate the dynamic mask. The weighted neural network approach is applied on cover image to perform the intensity level analysis. The high frequency area is identified as the effective mask to store the information. Once the mask is generated, the bit substitution approach is applied to store the information object. The analysis of work is here performed under PSNR value. The obtained results shows that the work is effective to store the information.*

*Keywords: Watermarking, PSNR, Neural Network, Dynamic Mask*

## I. INTRODUCTION

To provide the safe information transmission, one of the approach is to perform the encoded communication. This kind of secure information transmission is provided as an authentication system. Cryptography, steganography and watermarking are such approaches. Cryptography where transform the information to encoded form so that information extraction cannot be obtained by some some intruder or the third party. Steganography provides the way of information hiding within some multimedia object such as image, video, audio etc. Watermarking is very similar to steganography with some variations. Watermarking is also a concept based on information hiding that is able to provide the authentication as well as authorization. Watermarking is about to represent the ownership of some digital media. This content relation information hiding can be in visible or invisible form. The basic structure of watermarking is shown in figure 1

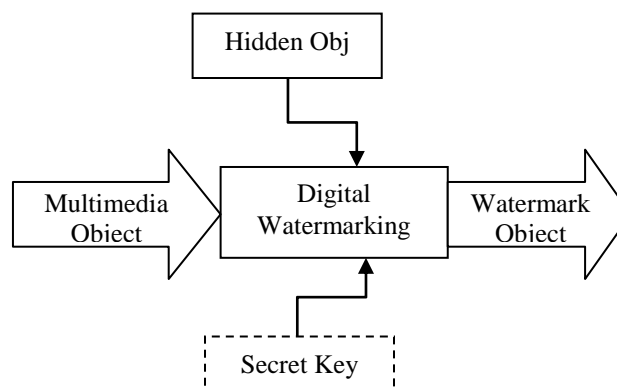


Figure 1 : Watermarking Model

As shown in the figure, watermarking process accepts the hidden object as input and multimedia object as the cover object. The watermarking process is based on the secret key that is used as the algorithmic approach that actually performs the data hiding within the multimedia object. The equational Representation of this watermarking process is shown here under

$$\text{WatermarkObj} = \text{Watermarking}(\text{MulObj}, \text{HiddenObj})$$

In same way, the reterival of the information from the watermarked object is shown here under

$$\text{HiddenObj} = \text{Extraction}(\text{WatermarkObj}, \text{SecretKey})$$

The extraction process accepts the watermarked object and the secret key algorithm as input and perform the information reterival.

There are number of associated approaches to perform the watermarking. These approaches are based on mask generation. According to this masking method, the approaches are divided in two main categories shown in figure 1

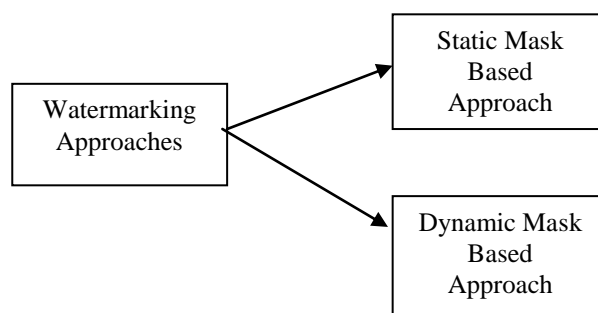


Figure 2 : Watermarking Approaches

The masking in watermarking is identified as the effective multimedia object area where the hidden object is stored. In case of static mask, the effective hidden object area over the image is pre-defined under some constraints specification such as LSB based watermarking. According to this approach always the least significant bit is considered as the effective data area where the information will be stored.

Another effective approach to hide the information is dynamic masking approach. Dynamic mask generation is actually the feature extraction approach applied over the multimedia object to extract the effective image area. There are number o associated approaches to generate the dynamic mask such as DCT (Discrete Cosine Transformation), DWT (Digital Wavelet Transformation) etc. Another effective dynamic mask approach is based on frequency analysis.

In this present work, neural network based approach is defined to analyze the multimedia image to generate the dynamic mask. In this section, the information security mechanism is defined based on watermarking approach. The work has defined the watermarking model along with relative approaches. In section II, the work defined by earlier researchers is defined. In section III, the presented research methodology is defined along with algorithmic approach. In section IV, the results obtained from the work are shown. In section V, the conclusion obtained from the work are presented.

## II. RELATED WORK

A Lot of work is defined by earlier researchers for digital information security and authentication. Author defined work on watermarking approaches. Some of the work defined by earlier researchers on watermarking approaches is defined in this section. Chuan-Yu Chang et al. [1] has defined a work on digital watermarking using neural network approach. Author defined a work to improve the data hiding under different attacks so that no information loss will occur. Author has defined a work to improve the robustness, imperceptibility in watermarking process. Fan Zhang et al. [2] has defined a work to improve the communication over the transmission channel by watermarking approach. Author has defined the capacity estimation based work to identify the storage capacity to hide the information. Author has defined a Hopfield Neural Network approach to identify the watermarking capacity. Author analyze the associativity based estimation to identify the effectiveness of watermarking process. Fan Zhang et al.

[3] has defined the Shannon formula based capacity estimation approach to improve the existing Hop Field Neural network approach. Mohammad Amrollahzadeh et al. [4] has defined DCT based block analysis approach to perform the data hiding. Author used the Huffman encoding approach at earlier stage to perform data compression and to improve the capacity of data hiding. Author has defined the watermarking to improve the quality of data hiding process and kept the authenticity of the work. Author has performed the analysis based on PSNR and MSE values to preserve the quality of the process. Ahmad R Naghash Nilchi et al. [5] has defined a hybrid approach using DCT and neural network to improve the watermarking process and by preserving the visual characteristics of the image. Author has embedded the contents by changing the contents under effective thresholding approach. Author has analyzed the work on binary image and obtained the effective results under different attacks. WANG Yun-Kuan et al. [6] presented a new watermarking approach to protect the media from copyright violation. Author has defined neural network based adaptive approach to improve the visual system. Author also integrate it with DCT approach to improve the robustness and the adaptability.

ZHANG Zhi-Ming et al. [7] has presented a RBF neural network approach integrated with DCT approach to improve the watermarking. Author defined the cryptography using chaotic approach at the earlier stage to improve the security and reliability. Author used the frequency level analysis along with DCT based block analysis approach to transform the information domain. Author has defined the attack analysis to improve the embedding process under component feature analysis. Author has defined the work under different attacks to show the robustness of work. Qiu Benseng et al [8] has presented a quantization algorithm to improve the adaptive vector encoding approach to identify the effective area where information will be stored. Author has defined a DCT improved neural network approach to classify the image under frequency analysis to identify the effective image area where information will be stored. Author has defined the vector quantization approach to improve the data hiding. Jun Zhang et al. [9] has presented a neural network approach to improve the integrity of copyright protection. Author has defined a wavelet based scheme to improve the watermarking. Author has defined a sub block based decomposition for storing the information effectively over these blocks.

### III. PROPOSED APPROACH

In this present work, a dynamic mask based approach is defined to improve the reliability of watermarking algorithm. The work is about to identify the effective intensity analysis over the image based on frequency level analysis. In this work, neural network based approach is defined to generate effective area where information will be stored. The presented work is defined as a two stage work. In first stage, the effective area identification is done using neural network approach. Once the area is identified, in second stage, the information hiding is performed. Here in figure 3, the proposed neural network based model is defined to perform watermarking.

As shown in the figure, the work has accepted the cover image and the hidden object image as input. To identify the effective area, the neural network is applied under different parameters. The parameters includes the specification of transfer function, weighted values and the layers in the network. Once the neural network parameters are defined, the next work is to identify the effective area from the image using neural network approach. This region identification is here done to extract the ROI over the image. This region analysis is performed in terms of high intensity area identification. Once the area is recognized, the next work is defined to hide the information in this recognized area by performing the bit level replacement. The algorithmic approach implemented in this work to hide the information is shown in table 1

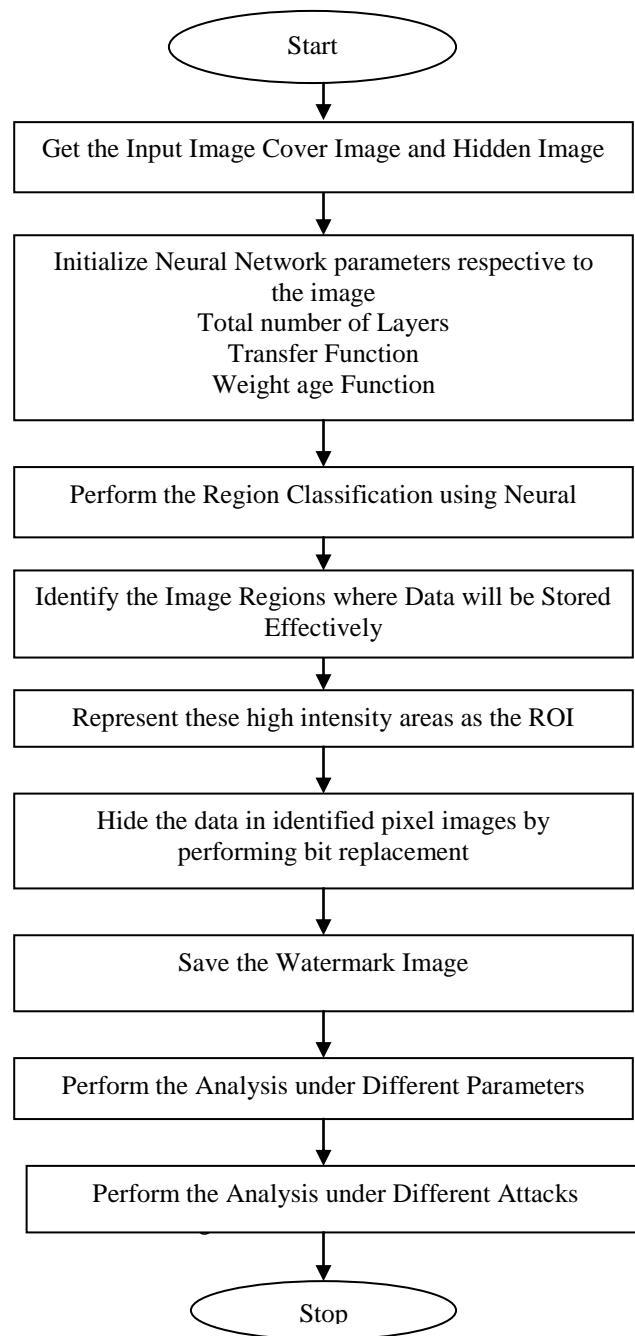


Table 1 : Algorithm

1.	Divide the image in image segments of some normalized size like $m \times m$
2.	Normalize the pixel value.
3.	Train the sub images using 3 layer back propagation Network.
4.	Pass the input to the input layer,
5.	From this input values some output is driven for the hidden layer. And after applying some weightage the output values are derived.
6.	Identify the Image Pixels where to store data
7.	Hide data over the image
8.	Calculate the MSE and other analysis parameters.

The presented work is based on neural network approach. The implementational stage based on neural network is shown here under

#### A) Neural Network

The back propagation technique described by Rumelhart et al was a very significant development in the field of neural networks, and has found many applications in a wide range of areas of research. The application of a simple three-layer back propagation network for image data watermarking was first proposed by Cottrell et al. and subsequently studied and developed by others [4,5]. Some inherent features of back propagation network image data watermarking schemes are: (a) the network structure is massively parallel, (b) the network is adaptive, (c) the network determines the compressed features of the original image in a self organizing manner during the training stage, and (d) the intrinsic generalization property of the structure enables it to process images outside the training set (novel images) effectively. In this work, this neural network approach is applied to identify the effective image area where information is stored.

## IV. RESULTS

To analyze the work, the work is tested on multiple images and analysis is performed under different parameters. The work is here implemented on multiple input images. The input image dataset considered in this work is shown in table 2.

Table 2 : Input Image Dataset

Image	Type	Dimension
Lena.jpg	Cover Image	512x512
Baboon.jpg	Cover Image	512x512
House.jpg	Cover Image	512x512
Man.jpg	Cover Image	512x512
Girl.bmp	Secret Image	128x128

The work is here tested on PSNR value analysis. PSNR provides the effectiveness of approach against noise. Higher the PSNR value more effective the results are considered. The PSNR results are shown in figure 4.

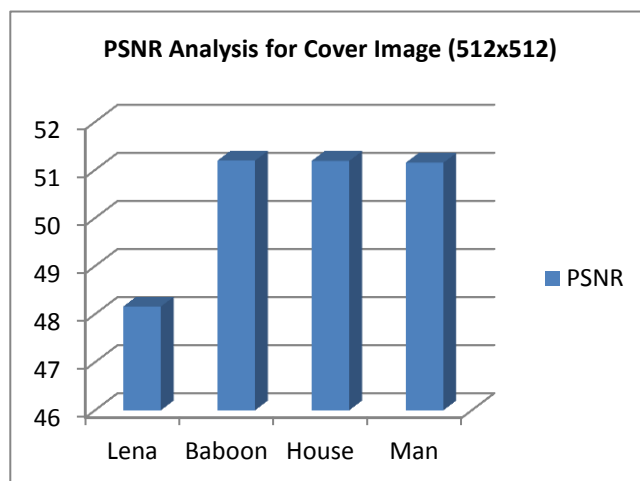


Figure 4 : PSNR Analysis

The figure shows that the baboon image has provided the most effective results in terms of PSNR value. The least results are provided by Lena image.

## V. CONCLUSION

In this present work, a neural network based approach is defined to generate the dynamic mask to identify the effective area where information will be stored. High frequency area is considered as the effective ROI where information is stored. To store this information, LSB based bit substitution approach is applied. The analysis shows that the effective results are obtained using neural network based information storage approach.

## References

- [1] Chual-Yu Chang and Sheng-Jyun Su "A Neural-Netowrk-Based Robust Watermarking Scheme" proceedings of National Science Council, Taiwan, pp.340-343,oct.2004.
- [2] Fan Zhang, Hongbin Zhang "Application of Neural Network to Watermarking Capacity" proceedings at International Symposium on Communications and Information Technologies, 2004(ISCIT 2004) Sapporo, pp.340-343, Japan 26-29 oct,2004.
- [3] Fan Jhang and Hongbin Zhang "Image Watermarking Capacity Analysis using Neural Network", proceedings of the IEEE/ACM International Conference on Web Intelligence pp.461-464,24-26 oct.2004.
- [4] Mohammad Amrollahzadeh and Siamak Talebi "A Blind JPEG Image Watermarking in the DCT Domain" proceedings of ICEE 2010, pp.311-315, 11-13 may, 2010.
- [5] Ahmad R Naghsh Nilchi and Ayoub Taheri "A New Robust Digital Image Watermarking Technique based on the Discrete Cosine Tranform and Neural Network" proceedings of IEEE, pp.1-7, 2008.
- [6] MEI Shi-chun, LI Ren-hou, DANG Hong-mei and WANG Yun-kuan "Decision Of Image Watermarking Strength Based On Artificial Neural-Networks" proceedings of the 9<sup>th</sup> international Conference on Neural Information Processing (ICONIP'02), Vol.5, pp.2430-2434, 2002.
- [7] Zhang Zhi-Ming, LI Rong-Yan, WANG Let "Adaptive Watermark Scheme With Rbf Neural Networks" proceedings of IEEE Int. Conf. Neural Networks & Signal Processing nanjing, pp.1517-1520, China ,14-17 december, 2003.
- [8] Bensheng, Qi Jianquin, AnPin, Zhang Diancheng "An Adaptive Vector Quantization Based on Neural Netowrk" Proceedings of ICSP'96, pp.1413-1416, 1996.
- [9] Jun Zhang, Neng-Chao Wang, Feng Xiong "A Novel Watermarking For Images Using Neural Networks" Proceedings of the First International Conference on Machine Learning and Cybernetics, Beijing, pp.1405-1408, 4-5 November 2002.