

# Otsu Segmentation & Discrete Wavelet Transform Based Binary Watermark Scheme

<sup>1</sup>Archika Jain, <sup>2</sup>Neha Shrotriya  
<sup>1</sup>Assistant Professor, <sup>2</sup> Assistant Professor  
<sup>1</sup>Computer Science & Engineering,  
<sup>1</sup>Vivekananda Institute of Technology, Jaipur, India

**Abstract - Information hiding has been an important research topic for the past many years. Unauthorized copying, tempering, copyright infringement invisible watermarking and multimedia data delivery these problems have been solved by many techniques. Information hiding techniques such as steganography and binary watermarking. In this paper, we shall focus on the binary watermarking and propose 1 level DWT based binary watermarking scheme. In this we extract the hidden message or we can say watermark from the cover image by using 1-DWT. First, we will do the binarization after that we will perform 1-DWT. In this we break the bands into four sub-bands that is LL, HL, LH and HH.**

**Key words - Watermarking, discrete wavelet transform (DWT), embedding rule, and extracting rule.**

## I. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it. We get an enhanced image or to extract some useful information from it. Otsu basically a Japanese word. Otsu method image thresholding on clustering basis and it reduce the gray level image into a binary image. In this we shall focus on the binary watermark scheme.

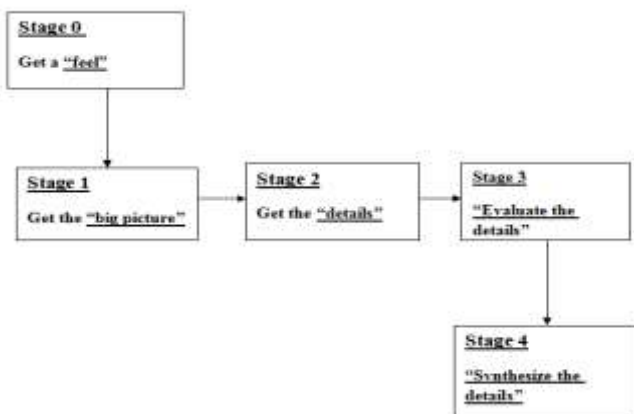
**Image segmentation:** Partitioning a digital image into multiple segments.

**Discrete Wavelet Transform:** In this wavelets are discretely sampled.

**Watermarking:** If hiding is done and some message part will be cut then message part can be detected as well as detected.

## II. REVIEW PROCESS ADOPTED

A literature review is necessary to know about the research area and what problem in that area has been solved and need to be solved in future. This review process approach was divided into five stages in order to make the process simple. The stages are:



**Fig 1: Review Process Adopted**

### Stage 0: Get a “feel”:

This stage provides the details to start the literature survey with a broader domain and classifying them according to requirements.

### Stage 1: Get the “big picture”:

The groups of research papers are prepared according to common issues & application sub areas. In order to understand the paper, it is necessary to find out the answers to certain questions by reading the Title, Abstract, introduction, conclusion.

### Stage 2: Get the “details”:

Stage 2 deals with to go on in the depth of each research paper and understand the details of methodology used to justify the problem, justification to significance & novelty of the solution approach, precise question addressed, major contribution, scope & limitations of the work presented.

### Stage 3: “Evaluate the details”:

This stage evaluates the details with respect to the significance of the problem, Novelty of the problem, significance of the solution, novelty in approach, validity of claims etc.

### Stage 3+: “Synthesize the detail”:

Stage 3+ deals with evaluation of the details presented and generalization to some extent. This stage deals with synthesis of the data and concept of the results that is presented by the authors.

#### III. VARIOUS ISSUES IN THE AREA

After reviewing 20 research papers on Otsu Segmentation & Discrete wavelet Transform Based Binary Watermark Scheme. We have found following issues, which have been listed as under. The issues are:

- 1) **Copyright protection.**
- 2) **Geometric attacks.**
- 3) **Copyright infringement.**
- 4) **Invisible watermarking.**

#### IV. ISSUE WISE DISCUSSION

##### Issue 1: Copyright protection:

Some approaches were used for this issue which are combined discrete wavelet transform and discrete courier transform based watermarking technique and Reversible image watermarking method are performed for image processing. By these solution approaches, copyright protection can be properly handled.

##### Issue 2: Geometric attacks:

Colour image watermarking scheme, Non-blind watermarking technique are the approaches that have been given. Color image watermarking scheme improves the robustness to geometric attacks. Non-blind watermarking technique achieve excellent robustness against different attacks.

##### Issue 3: Copyright infringement:

The technique of iterative blending technique for solves the problem of copyright infringement. It provides Robust against several attacks, such as cutting, median filtering, rotation and JPEG compressing.

##### Issue 4: Invisible watermarking:

DWT based watermarking scheme improves the robustness, quality of stego images and require less time cost.

#### V. ISSUE WISE SOLUTION APPROACHES USED

The solution approaches under the various issues have been shown in the **Table 5.1 to 5.4**, which includes additional information like hardware, software, variable/parameters used along with results obtained. The same table also describes the comparative analysis between various solution approaches. 8

##### Issue 5.1: Copyright protection:

S.No	Solution Approach	Results	Ref
1.	Combined DWT DCT based watermarking technique	It shows the correlation between the original watermark and the extracted watermark is more than 0.9.	[15]
2.	Reversible image watermarking method	It provide high embedding capacity, low computational complexity and improved security aspects.	[17]

Table 5.1 Issue wise Solution Approaches & Result

##### Issue 5.2: Geometric attacks:

S.No	Solution Approach	Results	Ref
3	Colour image watermarking scheme	It improves the robustness to geometric attacks.	[14]
4	Non-blind watermarking technique	Achieve excellent robustness against different attacks.	[13]

Table 5.2 Issue wise Solution Approaches & Result

##### Issue 5.3: Copyright infringement:

S.No	Solution Approach	Results	Ref
5.	Iterative blending technique	Robust against several attacks, such as cutting, median filtering, rotation and JPEG compressing.	[8]

Table 5.3 Issue wise Solution Approaches & Result

##### Issue 5.4: Invisible watermarking:

S.No	Solution Approach	Results	Ref
6	DWT based watermarking scheme	It improves the robustness, quality of stego images and require less time cost.	[9]

Table 5.4 Issue wise Solution Approaches & Result

##### Common Findings:

- Digital image watermarking technique based on wavelet transform is tested under Sharpen, Inverse, Gaussian, and Compress attacks to prove its robustness.
- Watermark image provide the good invisibility and strong robustness for common signal color because watermarked image was embedded into the low-frequency discrete wavelet coefficient of the color carrier image.

- Embedded method requires less time cost and provides better PSNR values for stego images and better NC values for extracted compared with Chang's method watermarks with/without attacks.
- The idea of applying two transforms DWT and DCT together gives effective watermarking. This algorithm has stronger robustness when it is attacked by JPEG compression, cropping, contrast adjustments, filtering and noises.
- In DCT based watermarking hardware is implemented using Beagle Board and shows a low cost, high performance watermarking system.
- Reversible image watermarking is used to extract hidden data to and from the watermarked image without any distortion to the original image.
- Contour-let transform based image watermarking techniques need a lightweight and robust watermarking method for inserting and extracting watermark from image.
- Watermarking technique is robust against several attacks, such as cutting, median filtering, rotation and JPEG compressing.

#### VI. SCOPE FOR THE WORK IN AREA

Discrete wavelet transform will be extended to describe the color image data. The discrete wavelet transform and inverse discrete wavelet transform will be applied on color images. Due to distributed nature of different input images it is very important to maintain the privacy mechanism and security issues should be taken into future work.

#### VII. CONCLUSION

The review of 20 research papers has been carried out in the area of Otsu Segmentation & Discrete Wavelet Transform Based Binary Watermark Scheme to investigate and find out current challenges and scope of work. After the review, I found several issues which should be given proper concern, when the effective segmentation of images takes place. These papers are a survey of different invisible watermarking issues that affect the related work that carried out in the area of image processing. Purpose of these methods and techniques is to achieve the robustness of the color images. I have found various four issues for which specific methods and techniques have been discussed.

The exhaustive review has finally led to extract findings in the area of Otsu Segmentation & Discrete Wavelet Transform Based Binary Watermark Scheme, strengths and weaknesses and scope of work during M. Tech 3rd semester research work.

#### VIII. ACKNOWLEDGEMENT

I would like to express our deep gratitude and thanks to **Dr. Mahesh Bunde**, Coordinator, M. Tech. School of Engineering & Technology, Poornima University, Jaipur, for giving us an opportunity to work under his guidance for our review of research papers and his consistent motivation & direction in this regard.

I extend our sincere thanks to **Dr. Manoj Gupta**, Provost & Dean, School of Engineering & Technology and School of Basic and Applied Sciences, Poornima University for his continuous support and encouragements throughout the course work.

#### IX. REFERENCES

- [1] Swanson, M.D.; Kobayashi, M.; Tewfik, A.H., "Multimedia data-embedding and watermarking technologies," *Proceedings of the IEEE*, vol.86, no.6, pp.1064,1087, Jun 1998.
- [2] Sin-Joo Lee; Sung-Hwan Jung, "A survey of watermarking techniques applied to multimedia," *Industrial Electronics, 2001. Proceedings. ISIE 2001. IEEE International Symposium on*, vol.1, no., pp.272,277 vol.1, 2001.
- [3] Celik, M.U.; Sharma, G.; Saber, E.; Tekalp, A.M., "Hierarchical watermarking for secure image authentication with localization," *Image Processing, IEEE Transactions on*, vol.11, no.6, pp.585,595, Jun 2002
- [4] Min-Jen Tsai; Hsiao-Ying Hung, "DCT and DWT-based image watermarking by using subsampling," *Distributed Computing Systems Workshops, 2004. Proceedings. 24th International Conference on*, vol., no., pp.184,189, 23-24 March 2004.
- [5] Potdar, V.M.; Song Han; Chang, E., "A survey of digital image watermarking techniques," *Industrial Informatics, 2005. INDIN '05. 2005 3rd IEEE International Conference on*, vol., no., pp.709,716, 10-12 Aug. 2005.
- [6] Tripathi, S.; Jain, R.C.; Gayatri, V., "Novel DCT and DWT based Watermarking Techniques for Digital Images," *Pattern Recognition, 2006. ICPR 2006. 18th International Conference on*, vol.4, no., pp.358,361, 0-0 0.
- [7] Zhicheng Ni; Shi, Y.Q.; Ansari, N.; Wei Su; Sun, Q.; Xiao Lin, "Robust Lossless Image Data Hiding Designed for Semi-Fragile Image Authentication," *Circuits and Systems for Video Technology, IEEE Transactions on*, vol.18, no.4, pp.497,509, April 2008.
- [8] Shun-liao Yang; Zheng-bing Zhang, "Digital Image Watermarking Using Iterative Blending Based on Wavelet Technique," *Multimedia Information Networking and Security, 2009. MINES '09. International Conference on*, vol.2, no., pp.83,86, 18-20 Nov. 2009.
- [9] Chandra, M.; Pandey, S., "A DWT domain visible watermarking techniques for digital images," *Electronics and Information Engineering (ICEIE), 2010 International Conference On*, vol.2, no., pp.V2-421,V2-427, 1-3 Aug. 2010.
- [10] Kapre Bhagyashri, S.; Joshi, M.Y., "Robust image watermarking based on singular value decomposition and discrete wavelet transform," *Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on*, vol.5, no., pp.337,341, 9-11 July 2010.
- [11] Lixin Luo; Zhenyong Chen; Ming Chen; Xiao Zeng; Zhang Xiong, "Reversible Image Watermarking Using Interpolation Technique," *Information Forensics and Security, IEEE Transactions on*, vol.5, no.1, pp.187,193, March 2010.
- [12] Arya, M.S.; Siddavatam, R.; Ghreera, S.P., "A hybrid semi-blind digital image watermarking technique using lifting wavelet transform — Singular value decomposition," *Electro/Information Technology (EIT), 2011 IEEE International Conference on*, vol., no., pp.1,6, 15-17 May 2011.

- [13] Salama, A.; Atta, R.; Rizk, R.; Wanes, F., "A robust digital image watermarking technique based on wavelet transform," *System Engineering and Technology (ICSET), 2011 IEEE International Conference on* , vol., no., pp.100,105, 27-28 June 2011.
- [14] Ying Zhang; Jiqin Wang; Xuebo Chen, "Watermarking technique based on wavelet transform for color images," *Control and Decision Conference (CCDC), 2012 24th Chinese* , vol., no., pp.1909,1913, 23-25 May 2012.
- [15] Deb, K.; Al-Seraj, M.S.; Hoque, M.M.; Sarkar, M.I.H., "Combined DWT-DCT based digital image watermarking technique for copyright protection," *Electrical & Computer Engineering (ICECE), 2012 7th International Conference on* , vol., no., pp.458,461, 20-22 Dec. 2012.
- [16] Aniyar, A.; Deepa, J., "Hardware implementation of a robust watermarking technique for digital images," *Intelligent Computational Systems (RAICS), 2013 IEEE Recent Advances in* , vol., no., pp.293,298, 19-21 Dec. 2013.
- [17] Khorramdin, M.; Amini, M.; Torabi, N.; Mahdavi, M., "Improving reversible image watermarking using additive interpolation technique," *Telecommunications (IST), 2014 7th International Symposium on* , vol., no., pp.961,965, 9-11 Sept. 2014.
- [18] Ibrahim, M.M.; Kader, N.S.A.; Zorkany, M., "A robust image watermarking technique based on image interlacing," *Radio Science Conference (NRSC), 2014 31st National* , vol., no., pp.92,98, 28-30 April 2014.
- [19] Chalamala, S.R.; Kakkirala, K.R.; Mallikarjuna, R.G.B., "Analysis of wavelet and contourlet transform based image watermarking techniques," *Advance Computing Conference (IACC), 2014 IEEE International* , vol., no., pp.1122,1126, 21-22 Feb. 2014.
- [20] Pathak, Y.; Dehariya, S., "A more secure transmission of medical images by two label DWT and SVD based watermarking technique," *Advances in Engineering and Technology Research (ICAETR), 2014 International Conference on* , vol., no., pp.1,5, 1-2 Aug. 2014.

