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# Review Paper on Digital Image Processing Technique

Urvashi Shri
*Assistant Professor, Computer Science Engg. Ambalika Institute*

***Abstract: In this modern era of digitization, progressed internet technology and evolved high speed networks, the need of the hour is Content protection. The technique Digital image processing is an extremely noticeable field for the research work since its various techniques are used as a part of a wide range of applications like human system interface, medical representation, image up gradation, law implementation, and digital watermarking for security purposes.***

## I. INTRODUCTION

Digital Image Processing is a quickly creating range in Computer Science. It is an extremely noticeable field for the research worksince its various techniques are used as a part of a wide range of applications like human system interface, medical representation, image up gradation, law implementation, and digital watermarking for security purposes. The digital watermarking is a utilization of the digital image processing. It is useful in wide range of applications. The technique digital watermarking was firstly used by TIRKEL in 1993. TIRKEL displayed two watermarking system to shroud the watermark digital data in the pictures. Digital image watermarking is a procedure of data covering up. Information/data is in the form of computerized substances like pictures, texts, audios & videos. Fundamentally, digital watermarking is a method for installing some valuable & confidential information in the cover image which can be later extracted or separated for various purposes like content validation, owner identification, content security and copyright assurance & so on.

## II. REVIEW OF WATERMARKING TECHNIQUES

In the last few years some watermarking schemes have been proposed to protect digital data. Many authors have proposed several methods based on DWT-SVD to embed watermarks.

JASDIP KAUR, NARWANT SINGH, CHAHAT JAIN[2016] proposed "An improved image watermarking technique implementing 2 level DWT & SVD". They described an improved algorithm to insert a watermark into the original cover picture. In this technique second level discrete wavelet transform is combined with the singular value decomposition (SVD). In this paper 1 level DWT is performed on watermark and 2 level DWT is performed on cover image. Singular value decomposition is utilized to insert the watermark into cover image. This technique ensured that the watermark is imperceptible, robust under attacks & more secured [4].

ANKUR SHUKLA, SHISHIR KUMAR [2016] described "A study of secure watermarking based on DWT-SVD technique for piracy". They proposed a secure watermarking method using DWT-SVD compression for preventing piracy. This method is based on cryptography. This paper provides a robust method which resist to many attacks. In this paper, utilization of the protected watermarking plan in view of DWT-SVD area is inspected for piracy. This method cryptography in light of undetectable and compressed (utilizing DWT-SVD) watermark picture inserted into cover picture without make an impression the imperceptibility and increment the security of watermark, this system gives a robust solution for watermarked picture. A relative study of different watermarks attacks is likewise analyzed. Space complexity nature has likewise been mulled over, which makes this system lesser space complex in contrast with different procedures. The results of the protected watermarking strategy are analyzed on the premise of entropy and PSNR values. [5].

SARAVANAN P,SRECKARA M & MANIKANTAN K[2016] present a digital image watermarking technique based on DWT& SVD transform along with DFT for color image [6].

F. TAHER, A. KUNHU& H. ALAHMAD [2016] present "A new hybrid watermarking algorithm for MRI medical images using DWT and hash functions" [7]. This algorithm authenticates the magnetic resonance tomography images and also provides copyright protection. This algorithm contains the robust and fragile watermarks. It works in both spatial and transform domain.

FURQAN & MUNISH [2015] studied and analyzed "A robust watermarking technique using Mat lab. They use the DWT-SVD scheme in the algorithm. In this paper, a signature or secret message is secretly inserted in the cover image.

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Using 2 DWT they divided the cover image into 4 sub bands and then applied SVD on each sub bands by updating their singular values [8].

SHAH, MEENPAL, &KOTECHA [2015] proposed "A DWT-SVD based watermarking technique for copyright assurance". Here one level dwt transform is applied on both watermark and cover image. After that embedding is performed by using the SVD. It satisfies both imperceptibility, robust and resist to geometric attacks. They used two quality measure Normalized correlation and PSNR are utilized to measure the robustness and imperceptibility of the watermarked data. Authors propose SVD based advanced watermarking procedure for robust watermarking of advanced images for copyright assurance. The security of the proposed process is expanded by applying another wavelet work. They likewise show the good connection between the inserted and the extracted watermark with the assistance of results comes about. One of the significant points of interest of the proposed plan is the robustness of the strategy on wide arrangement of attacks. Analysis and experimental outcomes demonstrate moved forward performance of the proposed strategy in correlation with the original SVD-based watermarking and the method without utilizing any wavelet work. [9].

JAISHRI GURU, HEMANT DHAMECHA & BRAJESH PATEL [2014] proposed a combination of DWT and SVD based digital watermarking techniques for robustness. They performed the first level discrete wavelet transform using HAAR wavelet functions. This technique provides high robustness under attack and improves the imperceptibility of the image [10].

YATINDRA PATHAK & SATISH DEHARIYA [2014] proposed "A more secure transmission of medical images by two level discrete wavelet transform and singular value decomposition based watermarking technique". In this paper, previously watermark was encrypted using a random key after that DWT-SVD technique was applied on each band [11].

MUSRRAT ALI,CHANG WOCK AHIN & MILLIE PAUT [2013] proposed "An optimized technique based on DE." This paper defines an optimized watermarking using 3 level DWT transform and DE (differential evolution). The benefits of this algorithm is that it automatically selects the best scaling factors based on the image and watermark but in other words it is constant for all types of image. An ideal Discrete Wavelet Transform- Singular Value Decomposition (DWT-SVD) based picture watermarking plan utilizing differential development (DE) calculation is given. Three-level DWT is connected to the cover picture to change it into sub-groups of various frequencies and after that apply the SVD to each sub-band of third level. In the wake of applying one-level DWT to the watermark, singular values in each sub-band of the cover picture are then changed by various scaling elements (SFs) to install the watermark image. The scaling components are upgraded utilizing the differential advancement calculation to get the most astounding conceivable robustness without losing the transparency. Experimental outcomes demonstrate that the proposed process keeps up a good image quality and watermark can in any case be distinguished after different attacks despite the fact that the watermarked picture is genuinely distorted [12].

HEMDAN,NAWAL EL- FISHWAY &EL – SAMIE [2013] proposed a hybrid digital image watermarking technique for information concealing. Here multiple watermarksare fused to build a single watermark. This paper proved that DWT-SVD based watermarking is more robust and secure in comparison to SVD watermarking algorithm [13].

SAXENA& GARG [2012] present a DWT-SVD based semi blind image watermarking techniques. They focused on only high frequency band of the cover image. Semi blind image watermarking means at the time of extraction cover image is not used. It has high robustness under geometric attacks [14].

CHIH LAI & CHING TSAI [2010] presented a digital watermarking process utilizing the DWT-SVD. In this paper, singular value decomposition was embedded in only 2 sub bands named as LH and HL The process completely exploits the particular element of these two transform domain techniques: spatial- frequency restriction of DWT and SVD efficiently speaks to intrinsic mathematical properties of a picture. Exploratory tests of the proposed strategy have indicated both the significant improvement in imperceptibility and the robustness under attacks. Additionally, work of incorporating the human visual framework qualities into this approach is in advance. .

Digital watermarking is the technique which makes use of image processing to embed the copyright content in the image. As we know there are many domains are present in the literature on which watermarking process is dependent. First, we have decided the reliable and secure domain to perform the work. At the current scenario domain, based watermarking is frequently used. Spatialand time/frequency/transform domains are the two important types of domain based watermarking. In comparison to spatial based techniques frequency domain is best in terms of robustness and imperceptibility. Frequency based domain has been decided. Further analysis and detail is carried out then DWT is used for the transform of pixels to frequency coefficient. n the proposed algorithm, we have decided to use second level discrete wavelet transform on LL band. We have applied watermarking on first level subsequently on second level. Since there are many wavelet functions are present in the literature.

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*A. Wavelet Transforms*

Wavelet transforms are the portrayal of a function with the help of wavelets. Wavelet is a sort of mathematical function used to separate a given function or persistent time signal into various frequency parts. Wavelets study every segment with a resolution which matches to its scale. Wavelets are formed by interpretation(translation) and dilations (expansions) of a static function called mother wavelet. DWTalludeto wavelets change in which the wavelets are discretely inspected. Wavelet is a mathematical tool for progressively decomposing a picture [16]. It is helpful for handling of non-stationary signals. It is essentially appropriate for pictures having higher visual resolution. At present, it is a prominent method utilized in signal manipulation, for example, sound and video compression, induction of noise in sound and replication of remote antenna apparatus distribution. DWT change depends on the wavelet matrix which is quick in contrast with Fourier matrix. It works in both localization, for example, time and spatial area. It satisfies the prerequisite of multi resolution analysis parts the signal into two band high recurrence band and low recurrence band. Again, both groups are isolated into two sub groups. A recursive filtering is done on both heading; therefore, part the picture into four sub groups to be specific LL, LH, HL,HH (Approximation, vertical. level.

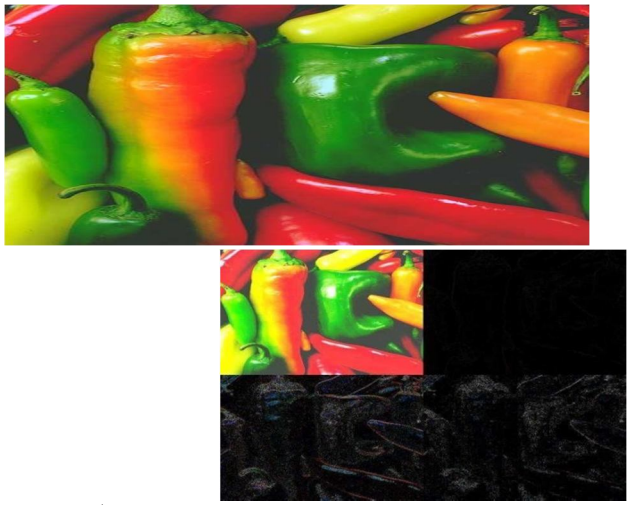


Fig :1st level DWT decomposition of cover image

*B. Wavelet Functions*

There are substantial number of wavelets are present in the wavelet toolbox that can be utilized in both discrete &continuous analysis. The selection of wavelet is based on the characteristics and nature of application of the signal or image. The most important wavelets are following:

HAAR wavelet, DAUBECHIES wavelet, SYMLET wavelet , BIORTHOGONAL wavelet

1) **HAAR wavelet:** It is also known as Db1. It is a special case of Daubechies wavelet. Any discussion of wavelets starts with Haar wavelet, the first and easiest. The nature of haar is discontinuous, and looks like a stage work. It resembles to an indistinguishable wavelet from Daubechies db1. The main DWT was imagined by the Hungarian mathematician Alfred Haar. For an information spoke to by a rundown of numbers, the Haar wavelet change might be considered to basically combine up input values, putting away the differences and passing the sum. This procedure is rehashed recursively, blending up the sum to give the following scale, at last bringing about contrasts furthermore, one last sum. The Haar Wavelet Transformation is a basic type of compression which includes averaging and differentiating terms, putting away detail coefficients, eliminating information, and remaking the matrix with the end that the subsequent matrix is like the underlying r is the simplest wavelet function which is used in averaging, differencing, storing & eliminating data. Haar transform has the following properties.

- It performs only additions.
- Computation speed is fast.
- Input and output lengths are same. It should be power of 2. Due to orthogonal property, itanalyzes the frequency component of input signal.

2) DAUBECHIES Wavelet: Daubechies is one of the importanttype of wavelets in the realm ofWavelet research designed what are called support minimalistic ally ed orthonormal wavelets — thus making discretewavelet analysis practicable. The names of the Daubechies family wavelets are composed dbN, where N is the request, and db the “surname” of the wavelet. [18]

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*3)* SYMLET Wavelet: this wavelet function is modified form of DAUBECHIES wavelet. Main goal of this transform is to improve the symmetry. In my work, I have used sym 5.5 wavelet function.

*4)* BIORTHOGONAL Wavelet:It provides the linear property. It contains two wavelets. First one is used for decomposition and second one is used for reconstruction. Decomposition means analyzing the signal. Reconstruction synthesized the signal. Biorthogonal have 1.1, 1.3, 1.5, 2.2, 2.4, 2.6, 2.8, 3.1, 1.5,2.2, 2.6, 2.8, 3.1,3.3, and 3.5 so on. First number represents the order of synthesis filter and the second number represents analysis filter. 1.1 is the default transform of this family.

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## III. CONCLUSION

Finally, we conclude that the 2nd level DWT – SVD watermarking approach is robust against several attacks. The principle goal of building up this digital image watermarking method is to fulfill both robustness and imperceptibility. Proposed watermarking technique shows Effective methods for securing image and copyright security and confirmation. Our proposed method gives effective outcomes contrasting with methods utilizing constant scaling elements. The technique completely exploits the separate component of these two transform space methods namely spatial frequency limitations of DWT and SVD effectively represents intrinsic algebraic properties of a picture. Test results of the proposed technique have demonstrated both the noteworthy improvement in imperceptibility and the robustness under attacks and different wavelet function. Experimental outcomes of these techniques affirm that the proposed schemes give good quality of watermarked image.

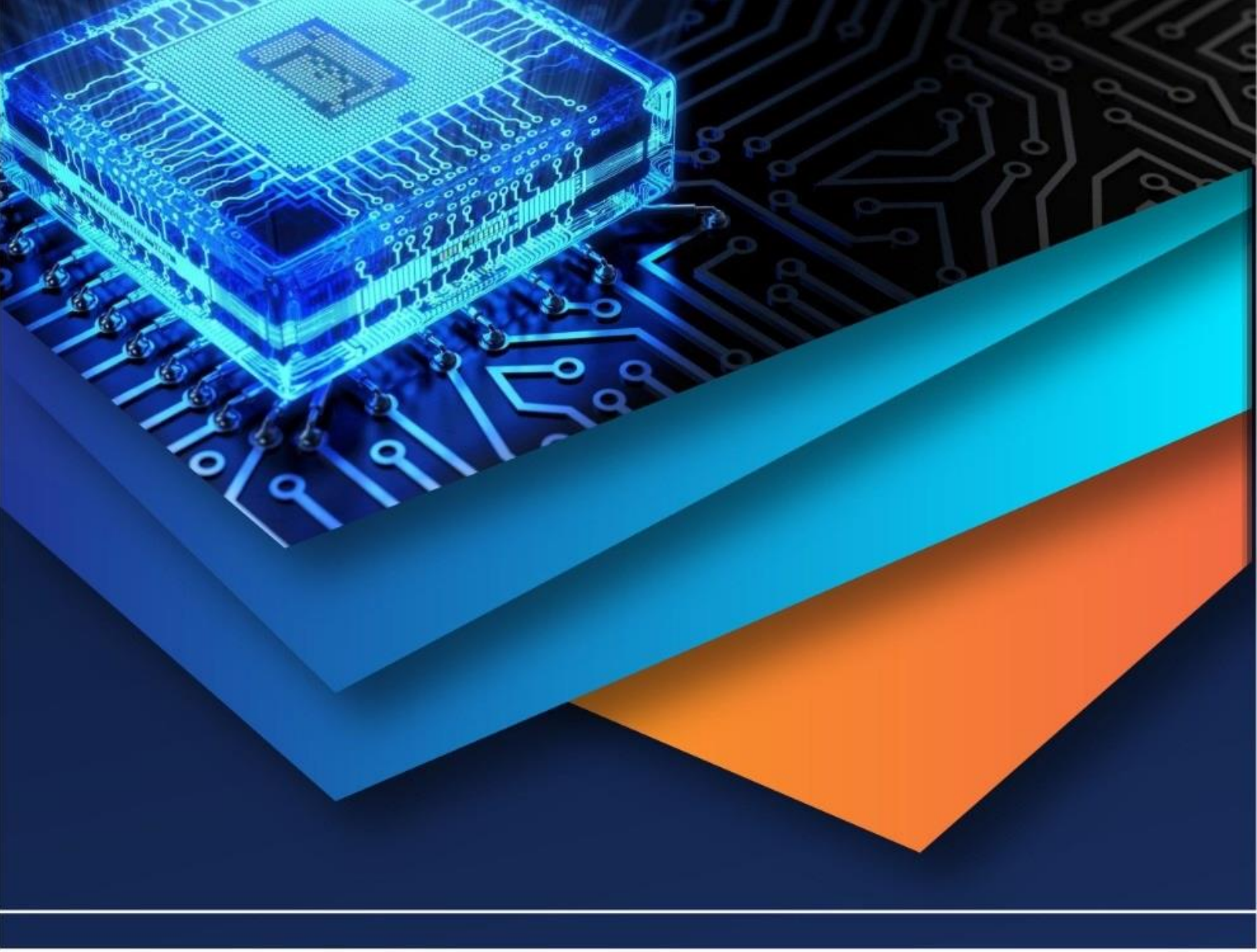
## IV. FUTURE SCOPE

In future the proposed method can be applied for video and audio watermarking and extend the method DWT up to third level transformation. By applying the proposed method for different purpose we can improve the level of security during the communication from one place to other place. We can improve the robustness and imperceptibility of the images.

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