

# Analysis of Watermarking Techniques

<sup>1</sup>Dr. Amit Verma, <sup>2</sup>Navdeep Kaur Gill

<sup>1,2</sup>Dept. Computer Science and Engineering, Chandigarh Group of College Landran, Punjab, India

## Abstract

Watermarking is a technique of embedding data or bits of data in a carrier signal. The carrier signal can be any i.e image, video or an audio. The data that is encrypted by employing the watermarking techniques may be visible or non-visible depending upon the type of technique used. The techniques of watermarking have undergone several changes with time and this has improved the efficiency of hidden data which in turn have improved the reliability of the system. Watermarking was done earlier in images for encrypting or hiding data and was used purposely for authentication. It was with the advent of time that watermarking was used for transmitting data securely so that no other user except the authorized person has the access to that data. Image watermarking was done earlier but now video watermarking is also done. The introduction of video watermarking has taken security to higher levels improving reliability to a certain extent. This paper is a review of different video watermarking techniques. The techniques of video watermarking that have been introduced till date are studied and comparison between all of them is made out to find the best efficient technique. The analysis of the results is done and the implementation is done using the MATLAB software.

## Keywords

Watermarking, Video Watermarking, DWT, DCT, Robustness, Perceptibility

## I. Introduction

Security is the biggest issue which is needed to be considered in today's technological world for transmission of data from one place to another. Need of the hour is that the data to be sent should only be accessible by the authorized person. Furthermore, the growing use of internet has made access to data more easy and this has increased the tempering of data which has lead to the problem about finding out whom the data originally belongs. The already published data was used by some other person by referring it as his/her own publication. This raised the authentication questions. It was then the need for authenticating the data was felt. This all lead to the invention of technique of watermarking. Watermarking is the originally a process of suppressing any information in a signal, the signal in which the data is to be suppressed is the carrier signal and it can be any form i.e. either image, audio or video or 3D models. There may be correlation between the carrier signal and the signal that is to be suppressed in that carrier but is not mandatory. Some people might mistake watermarking with steganography but, they both are not same. Steganography is somewhat similar to watermarking as both involve hiding data for security purposes by encoding it. The only clear difference between these two encrypting techniques is that in steganography the data in only text form or in the form of bits can be hidden in some carrier signal whereas in watermarking the data in either form i.e. text or image can be encrypted in the carrier signal. When, it is talked about watermark, it is mainly done as a mark of authentication. In watermarking, video watermarking is growing with fast pace in field of multimedia. The main reasons behind increasing demand of video watermarking are:

1. Growing rates of data hacking which has made access to private data more easy has raised alarms for user to secure

their data with better algorithms.

2. Frequent and hostile attacks on data have also questioned the copyright of the individual that needs to be preserved.
3. Easy access to data has increased the chances of tampering which needs to be stopped.

## II. Techniques of Video Watermarking

Video is a collection of numbers of frames or images that are continuously moving. A simple technique of video watermarking is extracting any frame from the collection and embedding the watermark into it and then adding the frame back into video. This whole process embeds the watermark into the video. Otherwise, the watermarking techniques are based on either spatial-domain or frequency-domain.

### A. Frequency-based Watermarking Techniques

#### 1. DWT Transform

In this frequency-based video watermarking technique the image is divided into four components i.e. horizontal, vertical, Diagonal and approximation components. This division is done to convert the image into low resolution image. The repetition of the process is done to calculate the multiple "scale" wavelet decomposition. The DWT technique or the Discrete Wavelet Transform is lucrative because it is more accurate in computation of the HVS model. The property of the DWT transform is that it is robust to noise.

#### 2. DCT Transform

The DCT or the Discrete Cosine Transform technique has the property of providing good signal approximations by employing certain coefficients. It is an important technique of watermarking as numbers of algorithms employed for watermarking employ this domain for embedding data. The advantages of DCT are that it is faster and it can be applied on O operations. The information in this transform is embed in the centre frequency bands because the frequency band is divided into various frequency bands. This technique is robust to lossy compression.

#### 3. SVD Domain based Video Watermarking

This is a technique of video watermarking which is based on numerical computing. In this technique the image is believed to be made up of three matrices. A variation in some elements of the matrix does not affect the content or the quality of matrix. The information of the watermark in this technique is added to the singular matrix which do not affects image quality and also takes care of the robustness and the imperceptibility of the image.

#### 4. PCA based video Watermarking

In this technique the color content and the information content of the image. All the video frames are made up of three channels and the watermark is embedded into these three color channels namely R, G and B of the video. In this technique the principal components are the basis for reducing the dimensionality of the image set values.

#### 5. DFT Transform

In this Discrete Fourier Transform based video watermarking

technique, the brightness of the frame that is watermarked is obtained and the magnitude of the coefficients is taken to compute DFT. In this technique inverse DFT is also applied. This technique is robust and resistant to various attacks like pixel removal and rotation.

### III. Objectives

Video is a set of certain frames or it is the continuous movement of certain picture set. Video watermarking is done for mainly copyright protection and authentication purposes. The need for video watermarking was felt due to increasing video piracy and tampering of videos. In the video watermarking a frame of the video is extracted and the watermark is embed in it which is then again put into the video and a watermarked video is obtained at the end. The watermark embedded in the video should have certain features like robustness, unobtrusive, Unambiguous, interoperable, universal etc. the objective of this review paper are:

1. To review the conventional watermarking techniques that have been developed till date and study advantages and disadvantages of these techniques.
2. To survey the papers on these watermarking techniques written by various authors and then compare their works in the field of video watermarking.
3. To find out the best effective technique developed for video watermarking by analyzing the results of applied techniques.

### IV. Findings & Analysis

**Dr.V.Seenivasagam, Professor [1]** In this paper the author has first defined a video. It is stated that a video is made by continuously moving set of videos. Video watermarking is done in order to increase the security and provide authentication to the owner and to provide copyrights to the owners. In this the data that is to be encrypted can be either text, audio or video and the data is embedded in the video. All the techniques of video watermarking developed till dates are reviewed in this paper and their merits and demerits are listed. Various techniques of watermarking are classified and their applications are discussed in the paper.

**G. Prabakaran [2]** In this paper the author is referring to digital media as an important source for transmission of data over internet. Security and authentication are the prime concerns for protecting the data from unauthorized users. In this paper the technique of Quick Response code is used for watermarking a video. SVD and the DWT techniques are used as a basis for designing this robust proposed technique of Quick Response Code. The applications of watermark include some sort of algebraic transformations that are provided by SVD. The watermark when embedded in a video embeds a logo in it that is a mark of the authentication of the owner. The application of SVD is on the I-frame whereas DWT is applied on the cover image and the QR code image. the frame is extracted first from the video for watermarking and it is then inserted in the video by inverse transform which results in the watermarked video. This video now contains the authentication mark and can be sent to customers to view it. the proposed technique is efficient and robust technique of video watermarking.

**Kesavan Gopal [3]** In this paper the author has proposed an efficient algorithm for video watermarking by using FPGA hardware and the proposed algorithm can be applied in real-time applications. The author has described about various watermarking techniques that have been applied on videos in their compressed and de-compressed forms. The watermark in a video can be done at three places i.e. at source or at the channel or at the reception side.

Very few data of raw videos have been processed for watermarking till date and it is where the techniques have been applied in the paper for watermarking. In the proposed technique of the paper the watermark is embedded in the initial stage of video production. Technique of DWT is employed for embedding the watermark and that increases the robustness. The efficiency of the technique is been proved after analyzing the calculated results which shows improved visual quality of the video and improved PSNR.

**Tamanna Tabassum [4]** In this paper the author has first mentioned the need which lead to video watermarking. Video watermarking at first was done to protect the copyright of the owner. Unauthorized uses of videos and growing piracy lead to extension of applications of video watermarking. In this paper the author has proposed a new technique for video watermarking based on the DWT. Extraction of identical frames is the basis of this new technique which is named as 3-level DWT. The whole video is first divided into smaller sub-videos and from these videos a frame is selected for watermarking. The decomposition of the frames is done by the technique of 3-level DWT and then watermark is embedded into the frames having high value of the coefficients of sub band. When watermark is embedded in this sort the invisibility of it is guaranteed. The proposed technique has proved to be robust against all types of attacks such as cropping and it also works well with noises such as salt & pepper noise or the Gaussian noise.

**Jamal HUSSEIN [5]** in this paper the author has mentioned the protection of the copyright of the owner as a major step towards security. In this paper the author chose two techniques and applied them on compressed and uncompressed videos and then compared the results to know which technique is better. The robustness factor is also considered while calculating the efficiency of the technique. The proposed technique in the paper is motion estimation approach that utilizes the wavelet domain for embedding data in particular bands. These types of watermarking are malicious to certain attacks because the motion has no affect on the watermark quality. The watermark is added by the proposed algorithm using HL and LH band. Random Gaussian distribution is another method of adding watermark to the video. The advantages of using the proposed technique is that it is robust against attacks like frame dropping, frame filtering and lossy compression.

**Hamid Shojanazeri [6]** In this paper the author stated the reasons like increasing use of internet and technology for increasing piracy in videos. More number of videos is being shared on internet, which questions the copyright and authentication of it. Algorithms are designed for protecting the copyrights of videos and for authentication purposes. Video watermarking is the process of hiding watermark or some secret sign or data in the video so that it can be afterwards used for detecting the owner copyright and for verifying the authentication of the video. In the paper the author reviews certain techniques of video watermarking. The basic factors determining the performance of watermarking technique are calculated like speed, imperceptibility, robustness etc.

**Loganathan Agilandeeswari [7]** In this paper the author has proposed a new technique for video watermarking by utilizing two techniques of DWT & SVD based on sub band selection procedure. In this paper the author has utilized two watermarks that are to be embedded in the video. These watermarks are the general watermark and the fingerprints of the owner. The sub band selection score of the cover video are evaluated and then the watermarks in the video are embedded. The efficiency of the proposed technique is verified by the robustness of the technique against possible attacks.

## V. Comparison Table

Sr No.	Author's Name	Tool	Technique used	Advantages	Disadvantages
1.	G. Prabakaran [2]	MATLAB	SVD & DWT based QR	Imperceptible and robust	Complexity
2.	Kesavan Gopal [3]	FPGA hardware	DWT	Robust Better visual quality Improved PSNR	Semi fragile nature Need single chip solution
3.	Tamanna Tabassum [4]	MATLAB software	3 level DWT	Robust against attacks and all types of noises	High complexity
4.	Jamal HUSSEIN [5]	MATLAB	Motion estimation approach	Robust against frame dropping, frame filtering and lossy compression. Higher invisibility	Need to be implemented on different video codec standards.
5.	Hamid Shojanazeri [6]	MATLAB	All techniques in frequency & spatial domain	Frequency domain techniques are better.	Protection is not against all possible attacks
6.	Loganathan Agilandeewari [7]	MATLAB	DWT & SVD based on sub band selection procedure	Robust against common image processing attacks	Lower embedding capacity

## VI. CONCLUSION

It can be seen that numbers of papers have been reviewed and various watermarking techniques have been studied. All the watermarking techniques developed were some advancement of the conventional techniques and the disadvantages of the earlier techniques were overcome in the new proposed technique. All the techniques were robust against one or the other attacks but had disadvantages like complexity or protection against attacks. The best technique was the DWT & SVD based on the sub band selection procedure that was robust against all possible attacks.

## References

- [1] Dr.V.Seenivasagam, Professor, "A Survey on Video Watermarking and Its Applications", IJARCSSE, 2014, Volume 4, Issue 3, pp 68-71
- [2] G. Prabakaran, "A robust QR-Code video watermarking scheme based on SVD and DWT composite domain", IEEE, 2013, DOI 10.1109/ICPRIME.2013.6496482, pp 251-257
- [3] Kesavan Gopal, "Watermarking of Digital Video Stream for Source Authentication", IJCSI, 2010, Vol. 7, Issue 4, No 1, pp 18-25
- [4] Tamanna Tabassum, "A Digital Video Watermarking Technique Based on Identical Frame Extraction in 3-Level DWT",
- [5] Jamal HUSSEIN, "Robust Video Watermarking using Multi-Band Wavelet Transform", IJCSI, 2009, Vol. 6, No. 1, pp 44-49
- [6] Hamid Shojanazeri, "Video Watermarking Techniques for Copyright protection and Content Authentication", IJCISIM, 2013, Volume 5, pp. 652-660
- [7] Loganathan Agilandeewari, "A Robust Video Watermarking Algorithm for Content Authentication using Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD)", 2013, International Journal of Security and Its Applications Vol. 7, No. 4, pp 145-158
- [8] Dr.V.Seenivasagam, 2014 "A Survey on Video Watermarking and Its Applications", IJERA, Vol. 4, Issue 12( Part 6), December 2014, pp.39-44
- [9] Pawan Singh Shekhawat, 2014 "Non Blind DWT Based Multiplicative SVD Watermarking Algorithm", IJSRD, Vol. 3, Issue 03, pp 1844-1848
- [10] De Li (2014) "Robust Adaptive Video Watermarking Algorithm based on Dual Transform Domains", International Journal of Multimedia and Ubiquitous Engineering Vol.9, No.1 (2014), pp.391-402
- [11] Lianjie Dong, 2014, "A blind digital watermarking algorithm based on DWT", JOCPR, Vol:6, Issue:3, pp 78-89
- [12] Myasar Mundher, 2014 "Digital Watermarking for Images Security using Discrete Slantlet Transform", Appl. Math. Inf. Sci. 8, No. 6, 2823-2830
- [13] Mr. Jagtap. D. V, 2014 "A Secure Data Transmission Scheme Based on Digital Watermarking (Image + Text)", IJARJET, Volume 3 Issue 8, pp 2713-2716
- [14] RAVIKANT S. MENDEGAR, 2014, "A ROBUST VIDEO WATERMARKING SCHEME USING 'ARNOLD', 'DWT' AND 'SVD' TRANSFORMATIONS", IJOER, Vol.2. Issue:3, pp 1-8
- [15] Kumareshan S "Estimate the Position of Pirate in Theatre", IJARCSMS, Volume 2, Issue 11, pp 121-124
- [16] Sunil Sharma "An Enhanced Video Watermarking Approach for Robustness And Security Using Pixel And Transform Domain in An Uncompressed Video", IJARSET, Vol. 2 Issue V, pp 41-46
- [17] Monika Sharma "A Hybrid technique of Video Watermarking in Wavelet domain and Scan based Encryption Method", IJEDR, Volume 2, Issue 3, pp 3220-3223
- [18] Neeta Deshpande "Robust Dual Watermarking Scheme for Video Derived from Strategy Fusion", I.J. Image, Graphics and Signal Processing, Volume:5, pp 19-27
- [19] I. Sivakami\* "A digital watermarking system for video authentication using the DCT", Integrated Journal of Engineering Research and Technology (IJERT) Jan-Feb 2014, Vol 01, 22-33.
- [20] Mundher, M., Muhamad, D., Rehman, A., Saba, T., & Kausar, F. (2014). Digital watermarking for images security using discrete slantlet transform. Applied Mathematics and

- Information Sciences, 8(6), 2823-2830.
- [21] Sharma (2014) "A Hybrid technique of Video Watermarking in Wavelet domain and Scan based Encryption Method"
- [22] Deshpande, N (2014). Robust Dual Watermarking Scheme for Video Derived from Strategy Fusion. International Journal of Image, Graphics and Signal Processing (IJIGSP), 6(5), 19
- [23] Mrs. Rashmi Soni "Digital Watermarking of Wavelet Transforms Based on Coding and Decoding Techniques", IJCSMC, Vol. 3, Issue. 3, March 2014, pg.1045 – 1051
- [24] Ekta Miglani ,2014"Digital Watermarking Methodologies - A Survey", IJARCSSE, Volume 4, Issue 5, pp 826-832
- [25] Li, Chen. (2013, December). The study on digital watermarking based on word document. In Mechatronic Sciences, Electric Engineering and Computer (MEC), Proceedings 2013 International Conference on (pp. 2265-2268). IEEE.
- [26] A. Agrawal (2014). Securing Video Data: A Critical Review. International Journal of Advanced Research in Computer and Communication Engineering, Vol:3, Issue:5
- [27] Islam (2013). A Novel Approach for Image Steganography Using Dynamic Substitution and Secret Key. American Journal of Engineering Research (AJER) Volume-02, Issue-09.
- [28] Mc Kevitt, P. (2010). Digital image steganography: Survey and analysis of current methods. Signal processing, Vol:90, Issue:3, pp 727-752.