Video Watermarking Using Wavelet Transformation

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***Abstract*- Internet plays an important role in today's life; maximum data transformation took place over the internet. Information stored in the digital format can be easily copied without the loss of quality and efficiently distributed. To solve the problem occurred in digital format we introduced the concept of digital watermarking. Digital watermarking is the branch of information hiding. This paper used a technique of embedding a watermark into video frames, which is the enhancement of digital watermarking. This paper helps in increasing the robustness in videos against various attacks by using wavelet transformation methods.**

***Keywords*- Video Watermarking, Wavelet Transformation, Discrete Wavelet Transformation, Robustness**.

I. INTRODUCTION

The faster distribution of data over the network via images, audio and video becomes a common resource. Hence, the owners and creators of the digital products are concerned about illegal copying of their products. As a result, security and copyright protection are becoming important issues in multimedia applications and services. To protect ownership, watermarking technique has been proposed. In this copyright information is embedded into multimedia data, which makes data transfer more robust and imperceptible. Image watermarking technique can be easily grouped into two major classes. a) Spatial domain watermarking and b) Frequency domain watermarking. In this paper we use frequency domain watermarking which is more effective with respect to achieve the robustness and imperceptibility and produces high quality watermarked images by transforming the original image into frequency domain. Commonly used frequency domain transformations are: Discrete Cosine Transformation (DCT), Discrete Fourier Transformation (DFT) and Discrete Wavelet Transformation (DWT). Mostly used transformation in image watermarking is DWT due to its excellence spatial localization and multi-resolution characteristic. There is various application areas in which watermarking is used: owner identification, proof of ownership, transaction tracking, content authentication, copy control, device control.

II. DISCRETE WAVELET TRANSFORMATION(DWT)

DWT is a mathematical tool for hierarchically decomposing an image. It is useful for processing N-stationary signals. In this transformation is based on small waves called wavelets. Wavelet transformation provides both frequency and spatial description of an image. Temporal information retained in the transformation process.

DWT is the Multi-resolution decomposition of image.

1. DWT splits the signal into high and low frequency parts.

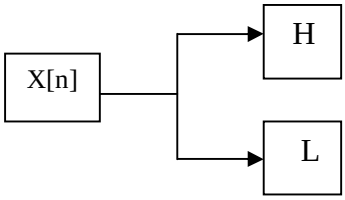


Fig.1: Splitting of signal

X[n] – Signal, H –Higher frequency part, L-Lower frequency part.

1. Higher frequency part contains information about the edge component, while the lower part again splits into the high n low frequency part, as shown in figure below.

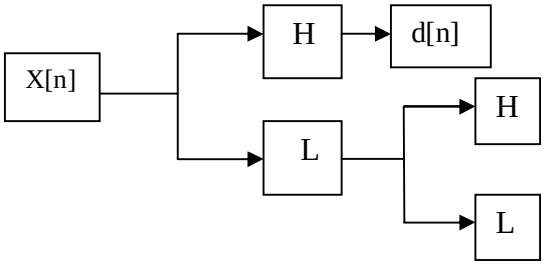


Fig.2: Splitting of higher & lower parts

High frequency component usually used for the watermarking since the human eye is less sensitive to observe the changes in edge.

For each level of decomposition 4 sub-bands (LL, LH, HL, and HH). For successive level of decomposition, LL –sub-band of previous level used as input.

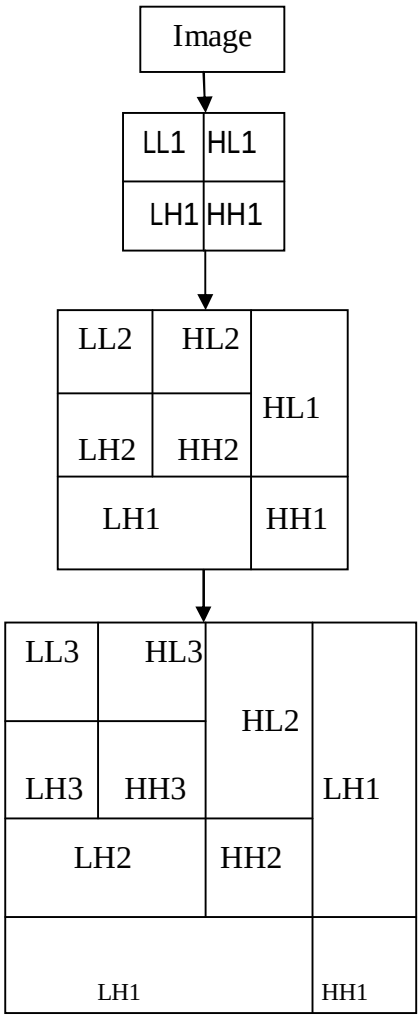


Fig.3: Discrete wavelet decomposition

III. WATERMARK EMBEDDING AND EXTRACTION

A. *Watermark Embedding*

Figure shows how to embed the watermark. The watermark embedding uses the original video, watermark and a user key to obtained watermarked video.

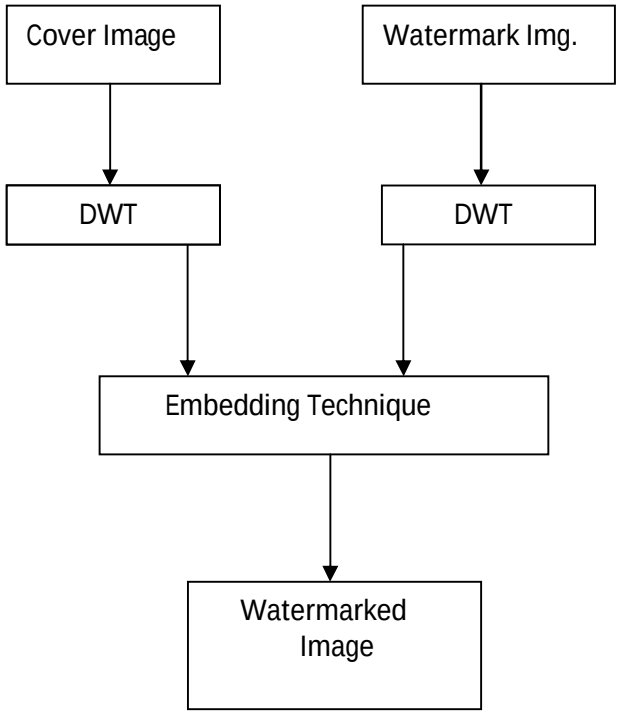


Fig.4: Watermark embedding

In the watermark embedding block, a copyright owner uses a private key to create a watermark on the file.

B. *Watermark Extraction*

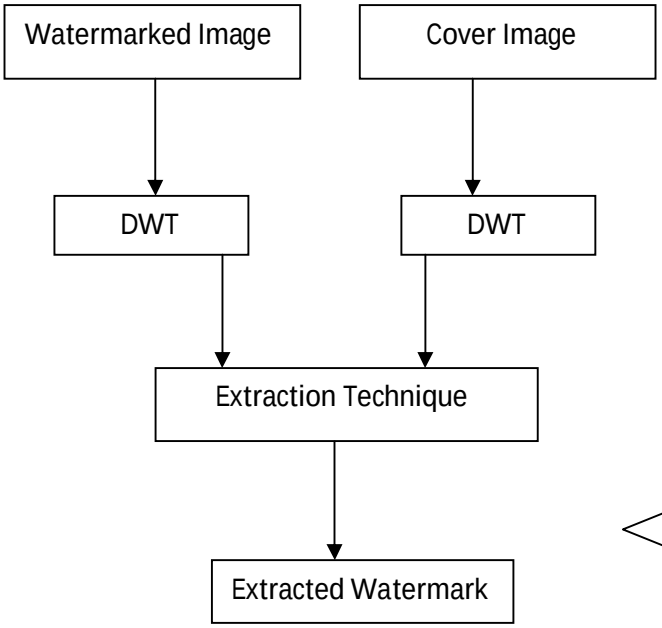
The watermark extraction uses a public key (user key) or a watermarked image to extract the watermark information. After extraction DWT applied to the watermark image coefficient to generate the final watermark extracted image.

$$RW = WM1-K*LL$$

RW: Low frequency approximation of recover watermark.

WM1: Low frequency approximation of watermark image.

LL: Low frequency approximation of original image.



IV. VIDEO WATERMARKING

Video watermarking is most popular technique for providing security and copyright protection. In this a video file is there which continuous collection of static images is. Image is composed of three color channels R,G,B. Watermark is embedded into three different RGB channels of the video frames separately using principal component analysis transformation. The main advantage of this approach is that the same or multi-watermark can be embedded into the 3 color channel of the image to increase the robustness of the watermark. The overview of watermarking process is depicted in figure6 given below.

First of all original color video is stored in one array then it is converted in to frames. Then scene change detection algorithm is applied on to the consecutive frames. If scene change found we have to change the watermark image else apply the same watermark within one scene of the video. Decompose video frame and watermark in to three different components. Apply the 4 level DWT on each component of video frame. Generate the secret key and add in to watermark data because watermark image bits are not enough for embedding in to original image. Apply the embedding algorithm for watermark embedding and store the watermarked data in to one array. Apply the 4 level inverses DWT to watermarked video frames. Repeat the entire step up to number of frames. Combine R.G.B. component of each watermarked video frames. So, we get the watermarked video.

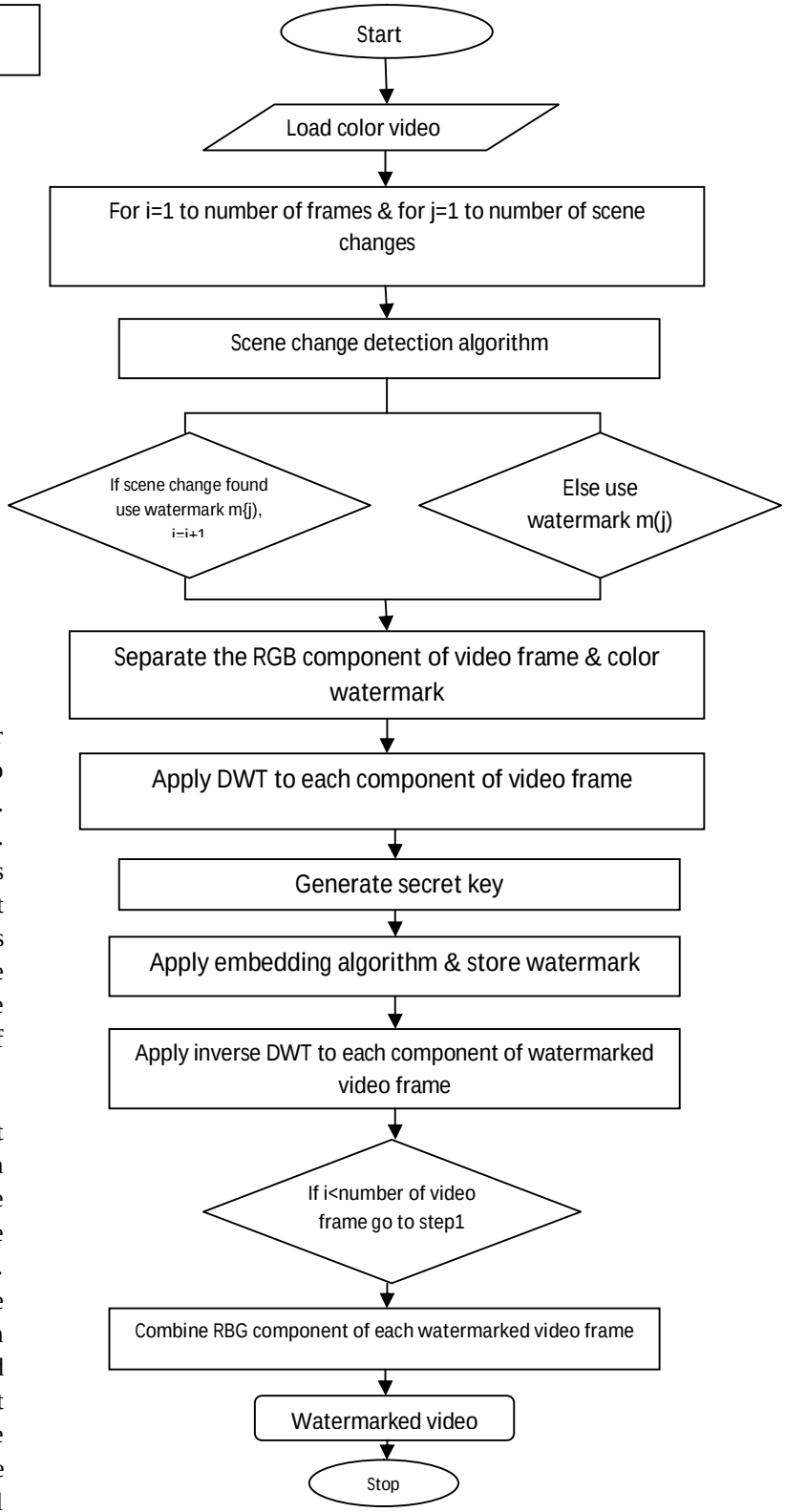


Fig.6: Overview of watermarking process

The desired properties of video watermarking are: provide the robustness, transparency, low error probability, recoverable from a document and capacity to videos. Video

watermarking can also help in providing: prove ownership, identify a misappropriate person and trace video dissemination. But some limitations are also present within the video watermarking, due to large amount of data and inherent redundancies between the frames. The limitations are Frame dropping, Frame averaging, Frame swapping.

V. CONCLUSION

Video watermarking is a secure technique for legal distribution of data. This paper describes the embedding and extraction of watermark into video and watermarking process. DWT helps in preventing the video from frame drooping, adding noise/another video. By combining the watermarking with steganography we can make this technique more robust against various distortions and attacks in videos.

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