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DIGITAL WATERMARKING OF VIDEO USING DCT AND EXTRACTION FROM ATTACKED FRAMES

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ABSTRACT

Watermarking of image is nothing but adding digital information related to owner for authority and copyright purpose. There are many techniques of watermark such as DCT, DWT, Haar wavelet transform. Digital image watermarking provides protection to copyright. The watermark embedding and extraction had been performed on video which contain number of images by using MATLAB. It shows multiple attacks on video frames and extraction of attacks. The ability to make perfect copies of digital video and the ease by which those copies can be distributed arise important issues of copyright protection. A method of copyright protection is the addition of a watermark to the video signal. The watermark is a digital code embedded in the video information before transmission or broadcasting which typically indicates the copyright owner. If different watermarks are applied to individual copies of the video, watermarking can also be used to indicate the identity of the legal receiver of each copy. This allows tracking back an illegally reproduced copy to the receiver of the copy from which the illegal copy is originated.

Keywords: Discrete Cosine Transform, IDCT, Embedding watermark, Attacks, Extraction of Attacks and watermark logo.

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I. INTRODUCTION

In recent years there is need to digitization of transmission of image, video's or any type of multi-mediea, so that there is need to add copyright of ownership in order to protect images or data from counterfeiting, piracy The technique of digital watermarking had been put forward by Tirkel in 1993.The Basic principle of the technique is that some information could be embedded into the original content and extraction will be done to give proof. There are two types of watermarking, visible watermarking and Invisible watermarking. Invisible watermarking prevents user to extracting original content also prevents illegal usage. The ability to make perfect copies of digital video and the ease by which those copies can be distributed arise important issues of copyright protection. And method to add copyright is nothing but adding watermark logo.[1]

Discrete Cosine Transform

In this project the methodology which is use is the discrete cosine transform (DCT) algorithm. The discrete cosine transform (DCT) represent an image as an addition of sinusoids of varying magnitudes and frequencies. The 2-D discrete cosine transform function computes the two-dimensional discrete cosine transform (DCT) of an image. The DCT has the property that, for a typical image, most of the visually important information about the image is concentrated in just small coefficients of the DCT. For this reason, the DCT is frequently used in image compression applications. For example, the DCT is at the heart of the international standard lossy image compression algorithm known as JPEG. The name comes from the working group that developed the standard: the Joint Photographic Experts Group. The discrete cosine transforms (DCT) help to divide the image into parts or spectral sub-bands of differing importance with respect to the image's visual feature. The DCT is similar to the discrete Fourier transform: it

transforms a signal or image from the spatial domain to the frequency domain.[6]

The equation for a 1D (*N* data items) DCT is defined by the following equation:

$$F(u) = \left(\frac{2}{N}\right)^{0.5} \prod_{i=0}^{N-1} A(i) \cos\left[\frac{\pi u}{2N}(2i+1)\right] f(i)$$

And the corresponding *inverse* 1D DCT transform is simple $F^{-1}(u)$, i.e
Where

The equation for a 2D (*N* by *M* image) DCT is defined by the following equation:

$$F(u,v) = \left(\frac{2}{N}\right)^{0.5}\left(\frac{2}{M}\right)^{0.5} \sum_{i=0}^{N-1}\sum_{j=0}^{M-1} A(i)\,A(j) \cos\left[\frac{\pi u}{2N}(2i+1)\right]\cos\left[\frac{\pi v}{2M}(2j+1)\right] f(i,j)$$

And the corresponding *inverse* 2D DCT transform is simple $F^{-1}(u,v)$, i.e.:

Where

$$A(\varepsilon) = \begin{Bmatrix} \frac{1}{\sqrt{2}}, for\ \varepsilon = 0 \\ 1\ otherwise \end{Bmatrix}$$

The classic and still most popular domain for image processing is that of the Discrete Cosine Transform, or DCT. The DCT allows an image to be broken up into different frequency bands, making it much easier to embed watermarking information into the middle frequency bands of an image. The middle frequency bands are chosen such that they have minimize they avoid the most visual important parts of the i.e.

$$I_{W_{x,y}} = \begin{cases} I_{x,y}(u,v) + k * W_{x,y}(u,v) & \text{if u, v} \in F_M \\ I_{x,y}(u,v) & \text{if else} \end{cases}$$

(low frequencies) without over-exposing themselves to removal through compression and noise attacks (high frequencies)[11]. In DCT domain we can have a 2-D watermark signal W, which is embedded in the middle band frequency of 8 × 8 DCT block. The 8 × 8 DCT coefficients F(u,v) are modulated according to the following equation:

The equation for a 2D (*N* by *M* image) DCT is defined by the following equation:

$$F(u,v) = \left(\frac{2}{N}\right)^{0.5}\left(\frac{2}{M}\right)^{0.5} \sum_{i=0}^{N-1}\sum_{j=0}^{M-1} A(i)\,A(j) \cos\left[\frac{\pi u}{2N}(2i+1)\right]\cos\left[\frac{\pi v}{2M}(2j+1)\right] f(i,j)$$

And the corresponding *inverse* 2D DCT transform is simple $F^{-1}(u,v)$, i.e.:

Where

$$A(\varepsilon) = \begin{Bmatrix} \frac{1}{\sqrt{2}}, for\ \varepsilon = 0 \\ 1\ otherwise \end{Bmatrix}$$

Here F_M denotes the middle band frequency coefficients, k the gain factor, (x,y) the spatial domain location of an 8 × 8 pixel block in image I and (u,v) the DCT coefficients in the corresponding 8 × 8 DCT block.In 1-D DCT transform, we are working only on the one dimension of the image while by 2-D DCT transform we are working on the two dimensions of an image.[8]

II. BLOCK DIAGRAM

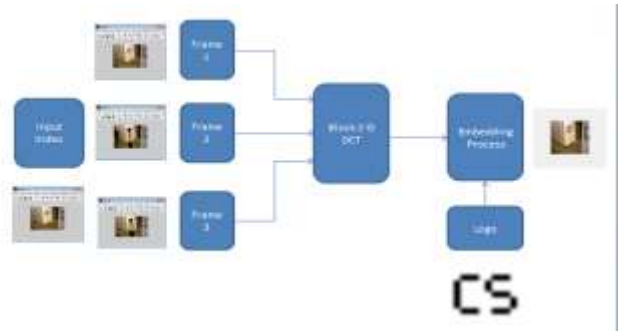

Fig.1:Block Diagram of embedding watermark in input video

Here video is splitted into frames and 2D DCT performed .after that actual embedding of original video frames and watermark logo done.[2]

Flow Chart:

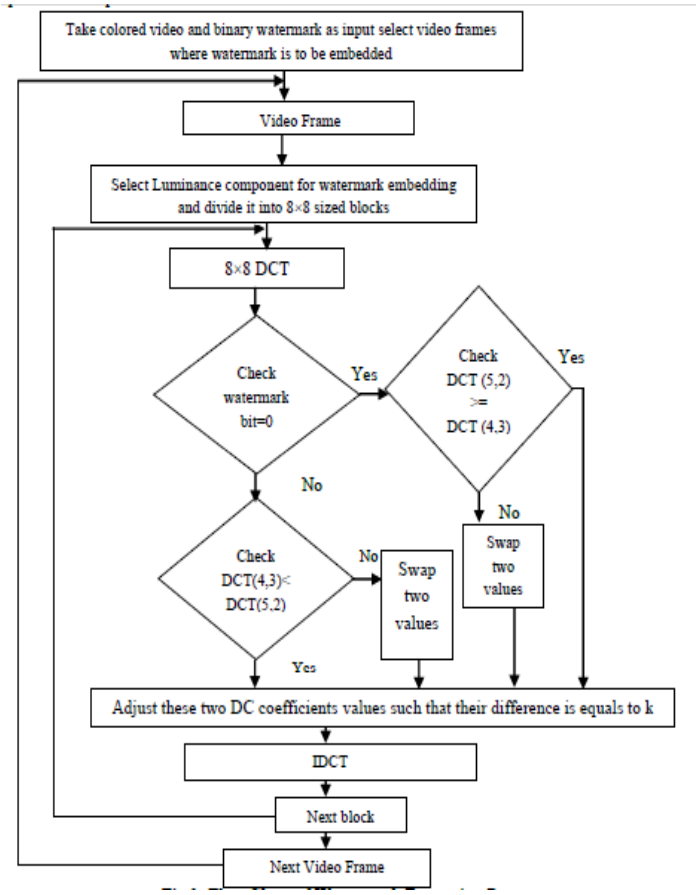

Fig 2: Flowchart of watermark embedding process

Attacking watermarked video

For evaluating the robustness of the proposed Video Watermarking method based on 2D-DCT, various attacks are included into the watermarked video. For illustrating the robustness of the watermarked video frames to various attacks, we included noise attack, frame dropping and cropping attack.[5]

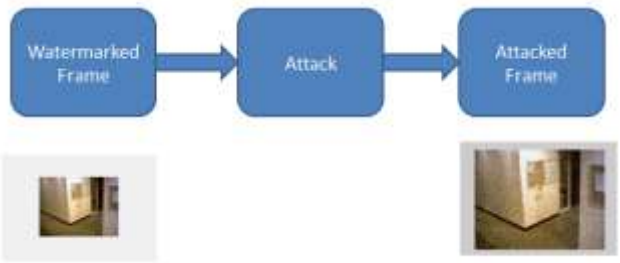

Fig 3: Introducing attacks in watermarked video

Attacks:

Cropping:

Cropping involves removing a part of of image from the watermarked video frames and situation of frames and dropping with different dropping size.

Salt and Pepper noise:

Salt and pepper noise presents itself as sparsely occurring white and black pixels. An effective noise reduction method for this type of noise is median filter or morphological filter. For reducing either salt noise or pepper noise, but not both, a contra harmonic mean filter can be effective.

Rotation:

By applying this attack we are rotating a particular frame by inputting the value of angle. It changes the pixel values of the input frame. While rotating them image the inbuilt function creates the spaces in between. These spaces are replaced by zero value.[9]

Watermark Extraction

Watermark extraction process is the inverse procedure of the watermark embedding process. The watermark extraction process as follows: Strength of watermark, totally different attacks applied on watermarked video. The embedded watermark was retrieved using proposed watermarking technique and NC values of recovered watermark are recorded for various attacks eventualities. The performance of the proposed watermarking technique has been measured in terms of its imperceptibility and robustness against all possible attacks like image 1) Addition of noise, 2) Frame dropping and 3) Temporal attacks. We used the some sample of video sequences in ".avi" format and after attacking we take this video to recover it.We applied this watermarked video to block 2D IDCT which will convert this video again back into 'n' number of frames.And this will tell us whether PSNR value is degrade or not and whether frame dropping was done or not if there is frame dropped then how many frames dropped we will know and its totally seen in the extracted video.[10]

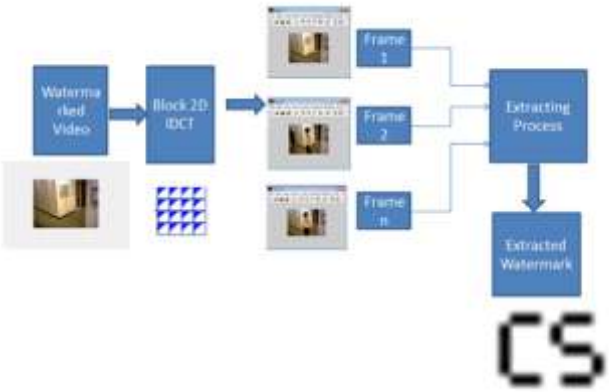

Fig.4: Extracting watermark

Flowchart:

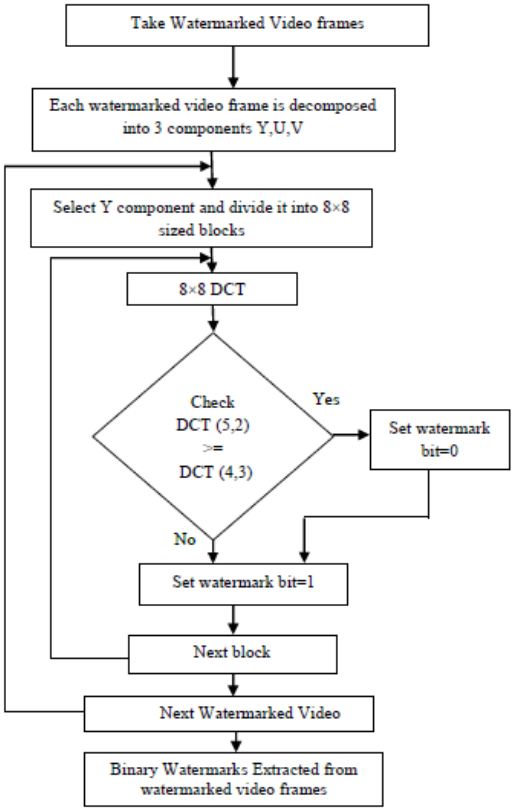

Fig 5:Flowchart of watermark extraction

Results Analysis:

Here we see the results of the embedding and etraction procedure.

Fig6: Original video frame

Fig7:Watermarked video frame

Fig.8: Salt &Pepper attacked video frame

Fig.9: Rotation attacked video frame

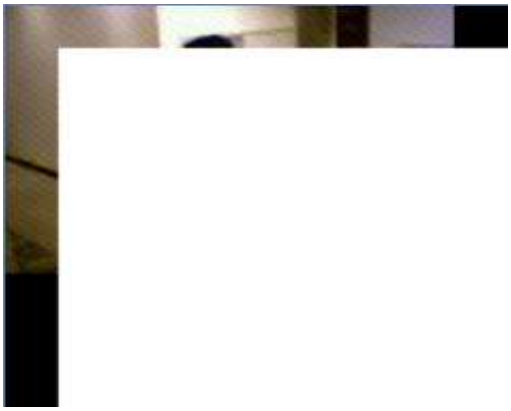

Fig11: Cropping attacked video frame

Fig2:Extracted watermark logo

III. CONCLUSION

Aim of our project is to study watermarking on multimedia and to verify the effect of various attacks on watermarked video. So until now we have studied the concept of watermarking on video, applying various attacks on video, measure the various parameters and its values.eg. PSNR, NC etc. We studied different techniques of video watermarking and attacks. The method we are working on is 2D-DCT based video watermarking technique which is blind method. First of all we have done image watermarking using DCT method and observed the results. And after that in the final phase we applied the attacks on video and got the result after applying the attacks on it. We have compared our proposed method with the Venugopala's method and we conclude that PSNR values of two videos are greater than the Venugopala's method and the two values are less than the Venugopala's method and this is the limitations of our proposed method and this future scope for work.

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