Dual Digital Image and Video Watermarking

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Abstract: The role of color image is very important today. The development of network and multimedia technologies, copyright protection and content authentication has become a serious problem today that need to be solved urgently. Digital video watermarking technology provides a strong solution for it.The DWT and DCT are two most popular transforms used in watermarking algorithm.

The wavelet transform plays a vital role in the image and video digital watermarking, and watermarking algorithm based on Discrete Wavelet Transform (DWT) causes more concern. This paper presents a dual purpose digital video watermarking algorithm based on DWT of color images. In this paper, we choose a suitable algorithm to embed watermarking and used a Arnold transform and chaotic encryption to provide a security. Due to this the system can protect the copyright of digital products and the authentication of certificates. The original video will be converted into number of frames and then the frames are converted from the RGB color space to the YCbCr components. The robust and fragile watermarking encrypted is embedded in the frames. The DWT is applied to Y, Cb, and Cr component separately. The chaotic encryption is applied after robust watermarking and the Arnold transform with the chaotic to the fragile watermarking and then the watermark is added to every channel separately so that the sensitivity and robustness will be increased.

Keywords: DWT, DCT, YCbCr, Chaotic encryption, Arnold transform;

I.INTRODUCTION

A. Digital watermarking

Digital watermarking is the process of embedding information into a digital signal in a way that is difficult to remove. The signal may be audio, image or video, for example. If the signal is copied, then the information is also carried in the copy. A signal may carry several different watermarks at the same time. Due to this the transmission of data the problem occurs for security of multimedia information and copyright protection of digital data and the files are accessed and destroyed. The information also changed through internet. So for the effective protection and information security we have to implement a Digital multipurpose watermarking algorithm.

II. LITERATURE SURVEY

This paper proposes a method of embed a digital watermark in image and video. In the watermarking, the decomposed watermark image with different resolution is embedded in the corresponding resolution of the decomposed video by means of multi resolution signal decomposing. The experimental results show that the proposed method is robust against the attack of frame

dropping, averaging and lossy compression. But watermark may not recover if it is damaged Noise Addition, Pixel removal, Statistical analysis, & Collusion.

In this paper, the author proposes an effective watermarking algorithm for copyright protection and authentication of digital products. In the proposed watermarking algorithm has excellent robustness against various watermark attacks with the high quality of the watermarked image.

Disadvantage of the existing algorithms includes the following.

1) The watermark is not robust to attacks which are particularly targeted at to videos.
2) Some algorithms embed only one bit information as the watermark which is slow.
3) Existing techniques are not aware of the usefulness of the audio channel in a video.
4) None of the existing watermarking schemes resists to all the attacks.

\To tackle these problems, in this paper, Author proposes a dual watermarking based on DWT and Arnold transform with a security algorithm with a hybrid approach.

III.GENERATION OF DIGITAL WATERMARK

3.1 Discrete Wavelet Transform

As one of the most glorious achievement in 20th century, DWT has become the most useful tool for image processing and analysis. The basic idea is to multi-frequency decompose the image into sub-bands at different frequency and different space, then to process the coefficients of the sub-bands.

An Image applied DWT is divided into four sub bands:

low frequency band (LL), horizontal detail band (HL), vertical detail band (LH), and diagonal detail band (HH). The image's energy is mainly focused on the low frequency band. The other three bands characterize the marginal information of the corresponding direction and have little energy.

3.2 Discrete Cosine Transform

DCT is one of the most popular linear transforms on digital signal processing. It has been widely used because of its good capacity of energy compression and decor relation. DCT is faster than DFT because its transform kernel is real cosine function while it is complex exponential in DFT.

3.3 Arnold Transform

The security of watermarking can be enhanced by scrambling or encrypting before watermarking is embedded. In this paper, the extended Arnold transform is used to scramble watermarking of copyright protection. Initial Arnold transform equation is as follows:

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Xn+l = (xn+Yn) mod 1

Yn+1 = (xn+2Yn) mod 1   (1)

mod 1 denotes that takes the fractional part only, namely *x mod 1=x-[x].* So the phase space of *(xn, Yn)* is restricted in square [0, 1] x [0, 1]. It transforms (1) to matrix form.

(Xn+ 1)= (1 1) (Xn)=c (xn) mod 1

(Yn+1) = (1 2) (Yn) = c (Yn) mod 1   (2)

Formula (2) defines matrix C. With it each

Watermarking pixel in different places can get a different place to embed. Arnold mapping has two typical factors to generate chaotic motion. One is tensile (multiplied by the matrix C to make x and y

larger), and another is folding (make x and y retract unit matrix by modulus). In fact, Arnold mapping is also a chaotic mapping.

3.4 Chaotic Scrambling

Chaos is a process which is fixed and same as random. This process is not periodic. It has more sensitive dependent on initial value. In this paper the chaotic algorithm is used to encryption and to provide more security of watermarking.

C. Encrypt Watermark

The two kinds of digital watermarking are encrypted by Arnold scrambling and chaotic sequence respectively. Chaos has excellent character in secure communication so that the encrypted image has excellent security. With the algorithm, users can generate chaotic sequence by the secret key, and then use transformation matrix generated by chaotic sequence to encrypt image.

IV EMBEDING AND EXTRACTION OF WATERMARK

4.1 Switch of Color Spac

YCbCr color model is a chroma model of coding mode, which is widely used in color display. Y is brightness and Cb and Cr is chroma. YCbCr space has the character to separate brightness and chroma. YCbCr room can be switched from RGB space.

4.2 Embedding Algorithm of Digital Watermark

The two different kinds of watermarking will be embedded in wavelet domain of color image.

a. Firstly embed fragile watermarking and then embed robust watermarking.
b. Firstly embed robust watermarking. Secondly embed fragile watermarking.
c. Embed robust and fragile watermarking at the same time.

Comparison of three kinds of embedded sequence, option a. is more feasible because fragile watermarking is very sensitive to distortion. If embed fragile watermarking in advance, robust Watermarking embedded later will destroy the fragile watermarking. So fragile watermarking will lost its role completely. In the option b. embed robust watermarking earlier and fragile watermarking later. The fragile watermarking will influence robust watermarking to some extent. It reduces the performance of robust watermarking and makes anti-interference ability of robust watermarking difficult to play out completely. In this paper, take the use of option c. It embeds two kinds of watermarking in different locations at the same time. Therefore, two kinds of watermarking can play its roles independently. The watermark is applied to Y, Cb and Cr component separately to the low frequency of each frame. Due to this the robustness and sensitivity are all better. To fragile watermarking, take use of Arnold transformation to transform binary image watermarking and then encrypt it with chaotic encryption algorithm.
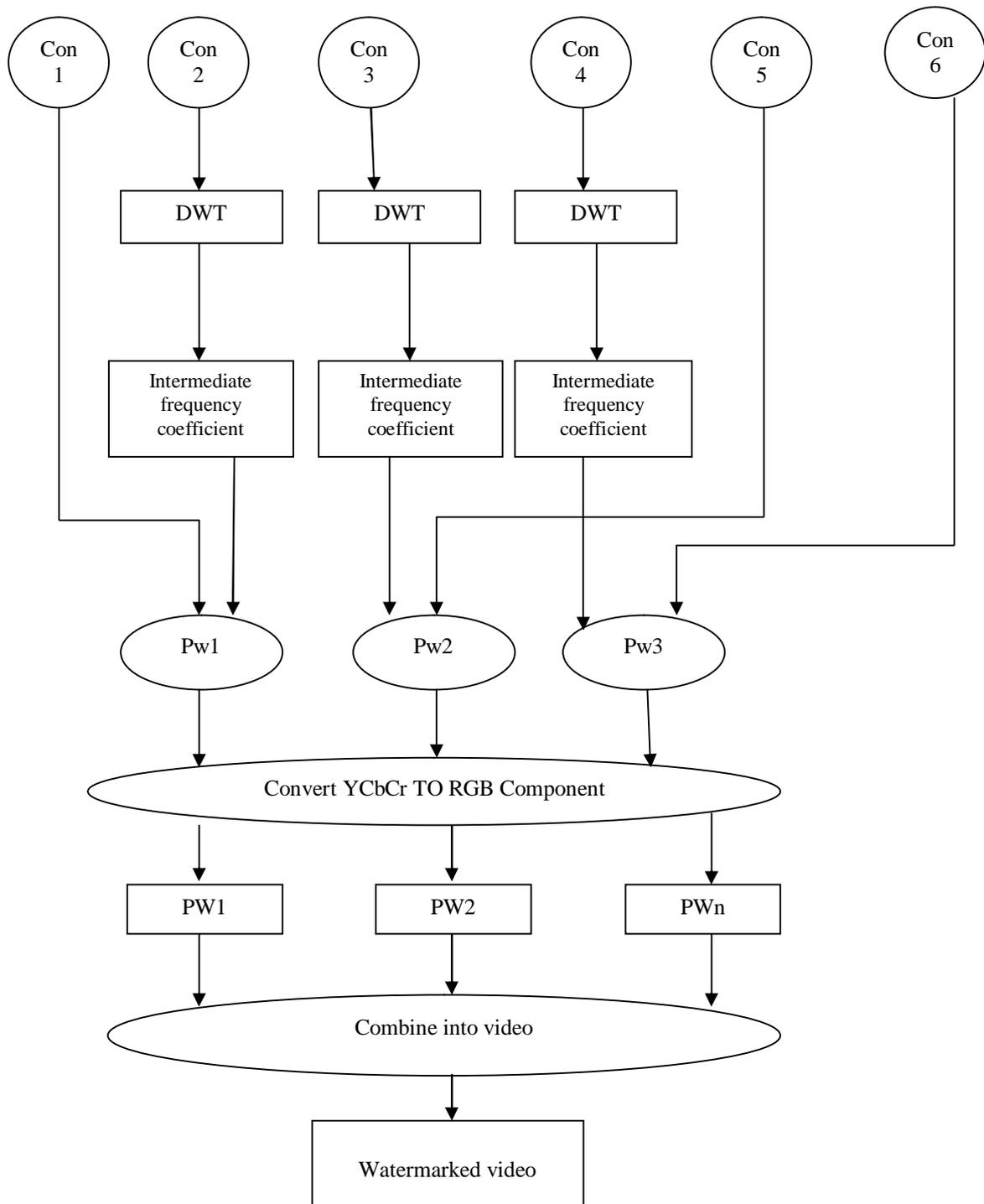The proposed flow chart of algorithm is as follows:
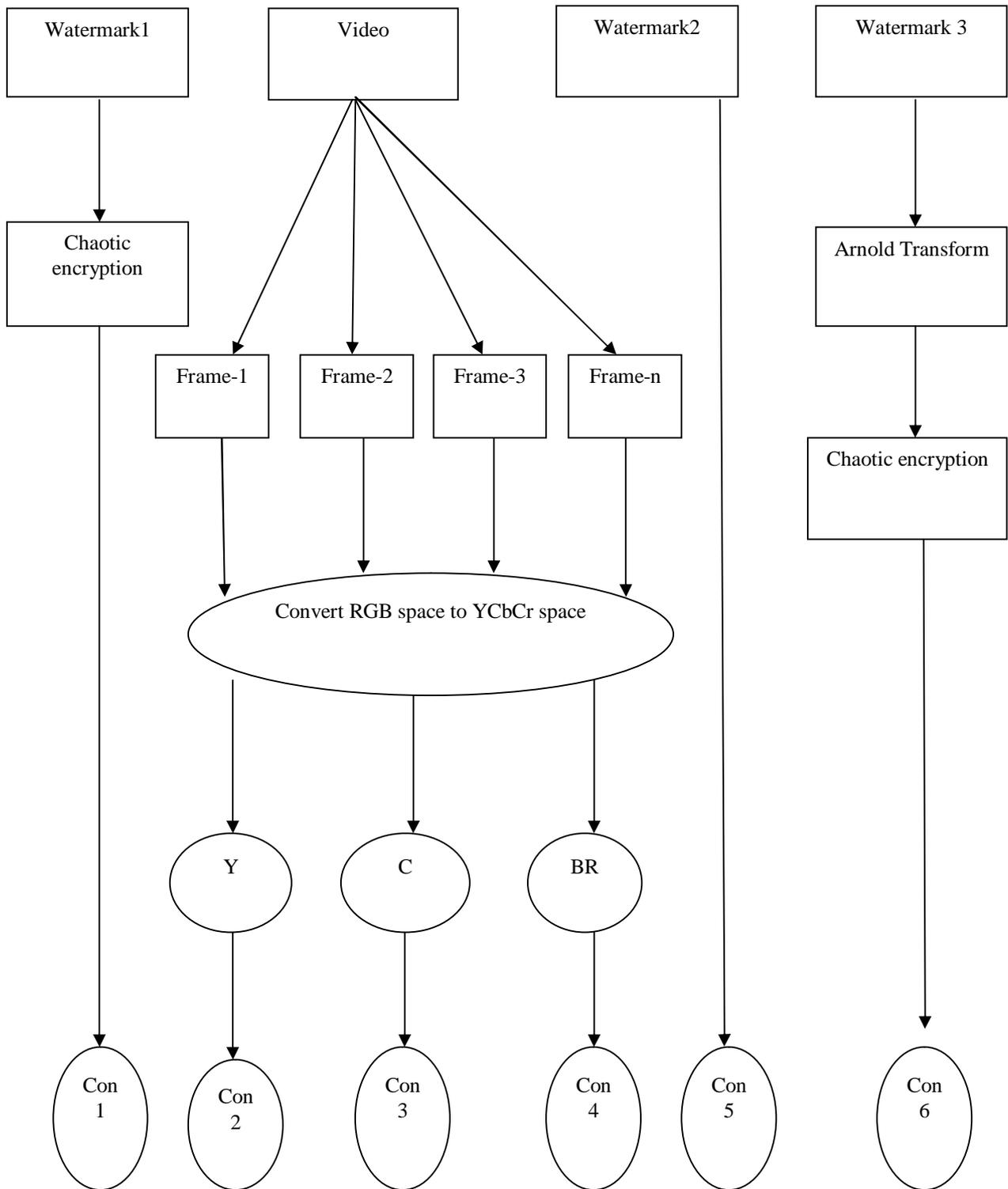
Figure 1 : Flow Chart

The embedding steps are as follows:

Step1: Chaotic encryption algorithm is used to robust watermarking.

Step2: Use Arnold transformation to transform fragile watermarking, and then encrypt it with CKBA encryption algorithm.

Step3: Use DWT to switch Y component in YCbCr domain. Information embedded is less as decomposition levels of DWT get more. So use four-level DWT to Y component in this paper, and then embed robust watermarking by chaotic encryption in the intermediate frequency coefficients and fragile watermarking in high frequency coefficients of Cb.

Step4: Use 4-level DWT to Cr component.

Step5: Use IDWT to switch Y component. Switch YCbCr room to RGB room. Then get color image embedded with watermarking.

4.3 Extraction of Watermark

Extraction of watermarking is reverse process of embedding watermark. We can draw the flow chart for the extraction of watermarking by the reverse engineering process.

CONCLUSION

This paper implements to achieve copyright protection and authenticity test for video. This paper gives a result of various images by a dual digital image and video watermarking system. Finally I can say Robust watermarking strongly protects common attacks for video watermarking and fragile watermarking is more sensitive to some attacks and provides security for video watermarking. By using this algorithm of watermarking of an image we can secure the image and video. By comparing to previous methods the performance of this algorithm is good.

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