

Image Processing and Watermark

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Abstract

The process of embedding the information into the carrier signal is watermarking. The information that is send should be secure from any unauthorized access. Various watermarking techniques have been proposed earlier but the security of the system was not achieved as required. So in this paper a new method of watermarking is introduced in which the encoding algorithms have been used. Before embedding the data into the carrier signal, the data is firstly encoded with the help of the encoding algorithm .In this approach the Fractal image Compression (FIC) and run length coding(RLE) is used for the data compression. Fractal encoding is a lossy compression method that explores the self-similar property for natural image. Run Length Encoding (RLE) is the lossless compression technique that used for reducing the size of the data. From the results obtained it is concluded that proposed algorithm is better and efficient than the traditional algorithm of the video watermarking as the security of the network is increased.

Keywords

Watermarking; Fractal Encoding; Lossy Compression, Lossless Compression, Video Watermaking

I. Introduction

Watermarking is the process of data embedding into the carrier signal. The carrier signal can be in the form images, text or video. It is one of the significant applications of the Image processing. The basic process of the image watermarking is to depict the owner identification or to provide the copyright protection. Digital watermarking is a technique that provides solution to the many longstanding problems related with copyright of digital data that can be detected or extracted later to make out some statement about the data. Video watermarking is the process in which the data is embedded into the videos. The application of the watermarking is to increase the security of the watermark that is embedded. Watermarking is growing as the important research area as the data security is the prime concern. At present most of the data is transferred over the internet that requires more security.

The process of watermarking is completed into two ways:

1. Data embedding
2. Data extraction

A. Data Embedding Process

In the data embedding process the data is embedded into the carrier signal. A carrier signal is selected in which is in the form of text, image or video. Then applying an encoding algorithm the watermark is embedded into the data and finally the watermark signal is obtained.

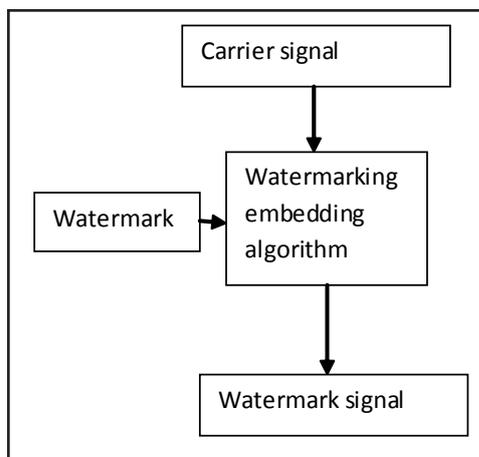


Fig. 1: Data Embedding Process of Watermarking

Data Extraction Process

In this process the data that is hid is extracted by the end user. In this the watermark signal is obtained and on it the decoding process is applied. This process will separate the watermark from the carrier signal and finally the watermark is obtained.

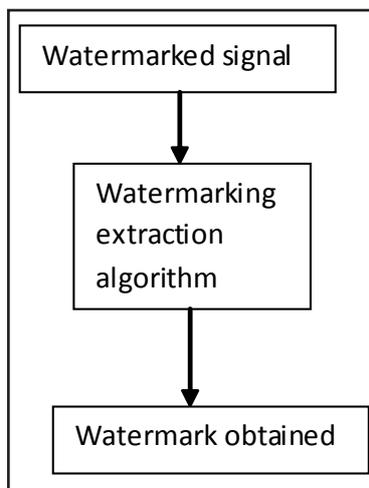


Fig. 2: Data Extraction Process of Watermarking

II. Challenges of Watermarking

Watermarking is the significant application of the image processing. Various challenges are faced while watermarking is done. The foremost problem is to maintain the robustness, storing capacity, invisibility and security of the data. These factors play important role in making efficient watermarking system. These factors are considered to be the important features of the watermarking system. The watermark that is embedded in the high frequency components but in high robustness occur in the low frequency component. Another important issues that is the fragile watermarking, if the data is slightly distorted the watermark will destruct. So by any making any change or by applying any technique can distorts the watermark. The cropping of the image or by applying any other process can destroy the watermark. The other issue that is considered to be the challenge is the human vision system. If the data is hid in the RGB image the blue color is less sensitive

to the human eye than the other colors so the data should not be hided in that part. The amount of information that is carried by the signal is termed as the Payload .if the play load is more the invisibility of the system is more. So to maintain the invisibility of the system is also any important issues. The robustness of the system is also a major issue of concern. In the spatial domain the pixel value changes due to which it cannot resist from the attacks. The computational cost of the system is also any issue of concern. So to remove these problems the new technique of the watermarking is to be proposed.

III. Algorithms

Video watermarking is the process in which the information is hided into the video. There are number of techniques that were used conventionally for watermarking likes DCT i.e. Discrete Cosine Transform. The conventional techniques embedded the data successfully in image but when it comes to videos there were number of drawbacks. The data that was to be embedded needed large number of bits and the edges were not preserved in those cases. This degraded the quality of watermark to be embedded and the video quality. The need was to design a technique with efficient results and better video quality. So in this paper the new approach is presented for the embedding of the data in the video frames. First one is the fractal encoding technique and the other one is the run length encoding. The encoding in the new technique proposed should be using lesser number of bits so that the error probability reduces. These are basically the compression techniques the data that is to hide in the video frame is firstly encoded by using these algorithms. This will increase the security of the system, increases the invisibility of the system. So this method is considered to be better and more efficient than the traditional method. The techniques used are described below:

A. Fractal Encoding

This is the lossy compression technique the main aim of this technique is to give construct the signal that is approximately same to the original signal. The similarity between the larger and smaller portion of the image is checked and thus the reliability of the image is also maintained. In this algorithm the image is converted into the fractal codes that are further used to recreates the encoded image. This algorithm firstly divide image into the block and then further divided these blocks into sub blocks for checking the self similarity in image. Now comparison between the bigger blocks and the smaller blocks is done. Difference between the blocks is analyzed and the data is encoded in the smaller block, as smaller is the block more accurate will be the encoding of the image .for the decompression of the image the reversed process is applied . The resolution independence is one of the major factors that will increase the display resolution of an image. In the process the image that is encoded into the fractal codes is decompressed at higher resolution.

B. Run-Length Encoding (RLE):

This is the lossless data compression technique in which the data values that occur in a sequence in the signal are stored as the single value and count instead of storing the original run. This is very useful technique as the storing capacity of the system increases.RLE can compress any type of data regardless of its information content, but the content of data to be compressed affects the compression ratio. So for large amount of the data in which same sequence of values is presently can be stored in less space. The given example can explain the run length encoding

algorithm .Consider a value having 17 run; the number of bytes to store the data will be 17. AAAAAAAAAAAAAAAAAAAAAA by applying run length encoding technique this value will be saved as 17A. So the number of the storing bytes will be reduced and large amount of data can be stored.

IV. Proposed Work

This section represents the methodology of the proposed work .in the proposed work new technique of video watermarking is proposed in which the compression techniques are used for the compressing of the data before the data is embedded in the frames of the video. In this work the two data compression techniques are used one is the fractal encoding and the other one is the Run length encoding .By compressing the data before it is hided in the video increases the security and the storing space of the system. Also the transmission capacity of the system increases. This proposed method is considered to be better than the traditional techniques of the video watermarking.

A. Methodology of the Proposed Method

The methodology of the proposed work is divided into two sections, first part is the embedding the watermark and secondly extraction of the watermark:-

1. Embedding the watermark in the image

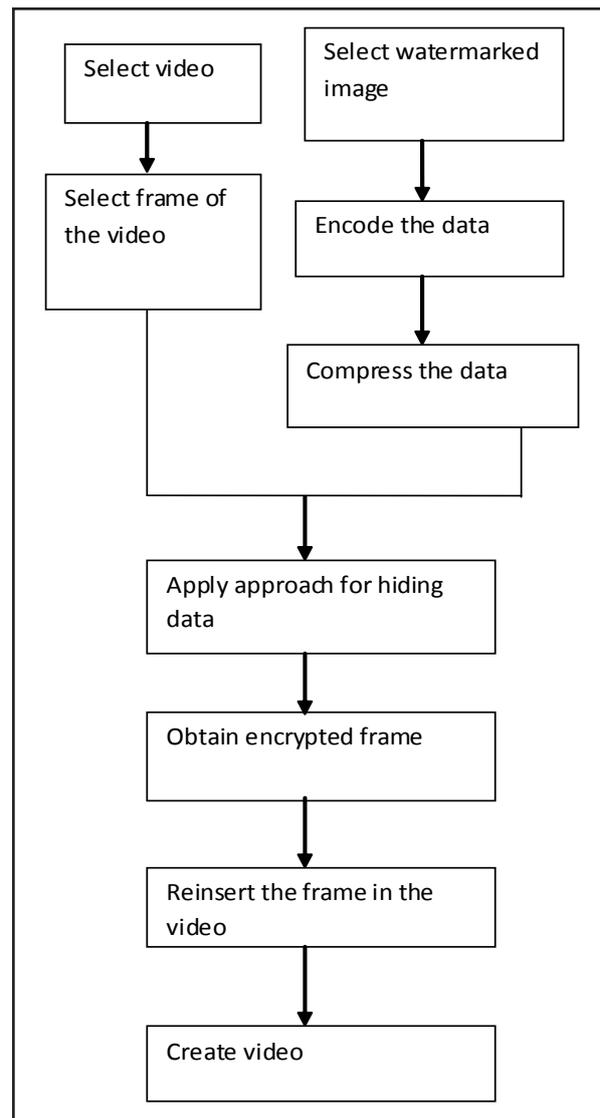


Fig. 3: Block Diagram of Proposed Methodology

B. For Embedding of the Watermark

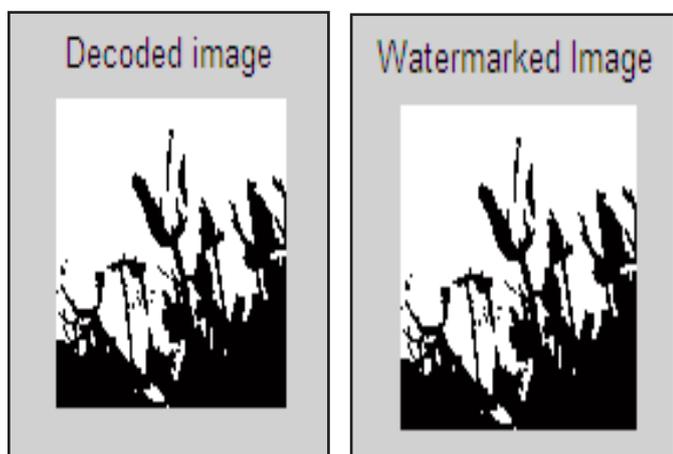
1. Initially select a video, select the frame of the video.
2. Now, select a watermark image and apply encoding for data compression
3. Now apply approach of data hiding.
4. After this obtain the encrypted frame and reinsert the frame in the video.
5. Finally the video is created.

V. Extraction of the Watermark

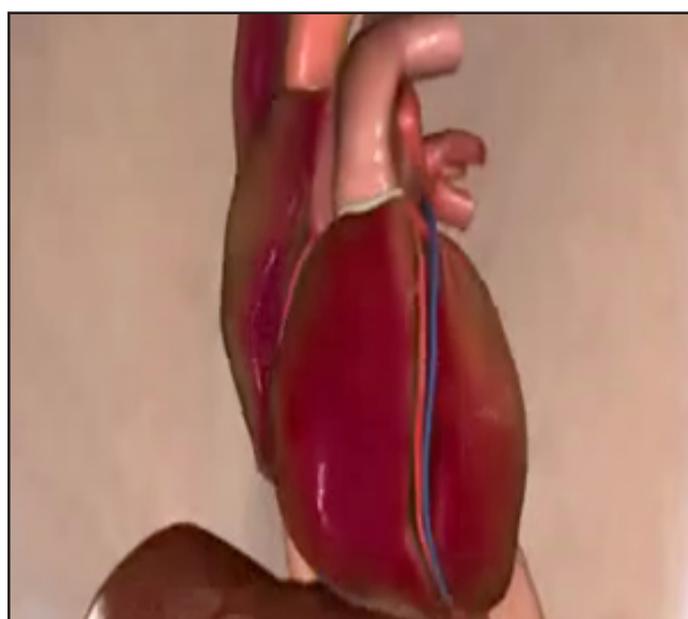
The extraction of the watermark process is the inverse of the embedding process.

V. Results and Discussion

In this section there is discussion about the results of proposed method of image watermarking. In this paper an approach is implemented for video watermarking. The data compression technique is applied before the data is embedded in the video. The following figures represent the processing of embedding and extracting the watermark. The watermark is embedded into the frames of the video.



(a). Watermarked Image (b). Decoded image



(c). Video in Which Watermark is to be Embedded

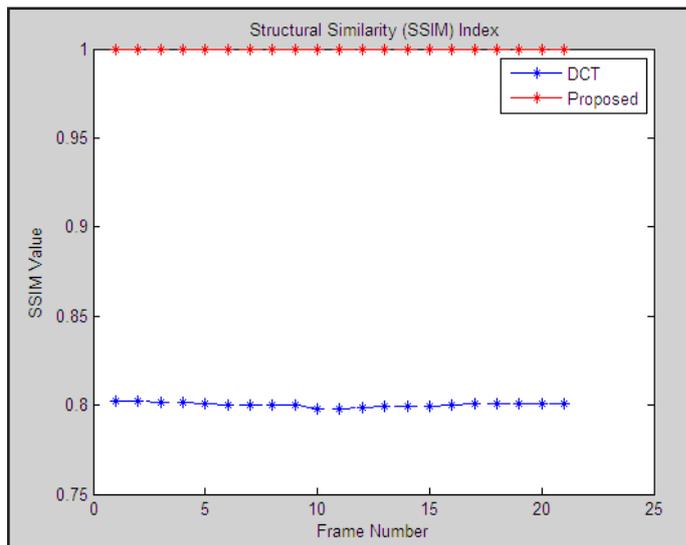


Fig. 4: Comparison Graph on the Basis of SSIM Value

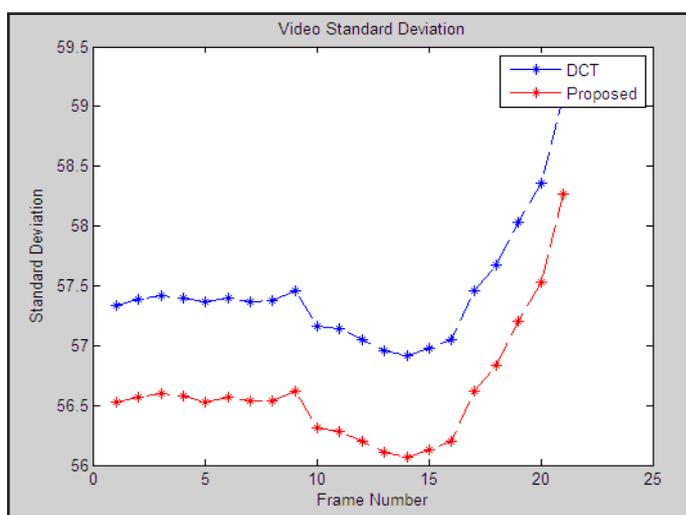


Fig. 5: Comparison Graph on the Basis of the Standard Deviation

The graphs above present the comparison of the proposed algorithm with the traditional DCT algorithm. On the basis of the result obtained it is concluded that the proposed algorithm is better and efficient than the traditional algorithms of video watermarking.

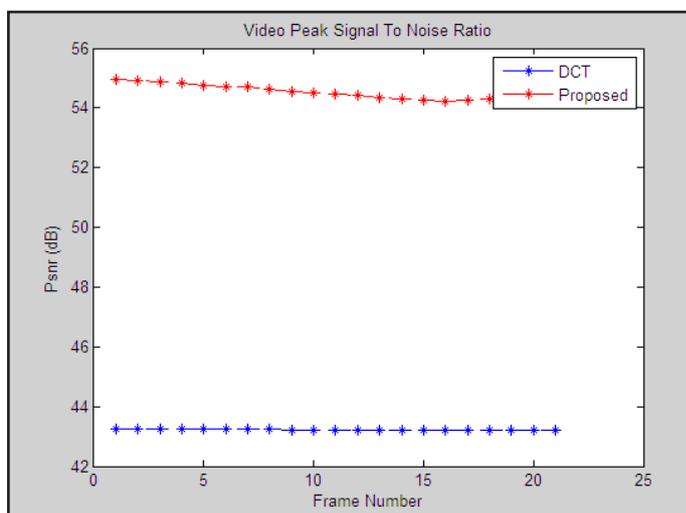


Fig. 6: Comparison Graph on the Basis of the PSNR Value

VI. Conclusion and Future Scope

Watermarking is an efficient method of hiding the data in the carrier signal; this is done to increase the security of the data that is to send. Video watermarking is the procedure of hiding data in the video frames. From the results obtained it is concluded that this technique is better than the traditional techniques like DCT, as the comparison between the DCT and the proposed technique was done and various parameters were calculated like PSNR, Variance, Standard deviation etc, from all these parameters it was concluded that the performance of the proposed technique was better than the traditional technique. Also the security of the data is increased using this technique.

The proposed technique is better than the traditional techniques. It is analyzed that in future further work can be done by using some compression technique. This will also increase the security of the data that is the major concern. So in future the work can be done on some other compression technique or by combining the various compression techniques.

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