VIDEO COMPRESSION FOR REAL-TIME SECURED TRANSMISSION

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Abstract: This paper provides a video compression using Discrete Cosine Transform (DCT). It also provides a secured transmission by using modified AES Algorithm. The video requires a large amount of memory as well as data during transmission and it also consumes maximum amount of time for transmission of that video. So, in order to reduce the amount of usage of data and memory that video size should be compressed and transmitted. Hence the proposed system uses DCT algorithm to compress the video size and also to get better compression rate by maintaining the video quality. And it also uses modified AES algorithm and scrambling process for secured transmission. The PSNR and MSE is calculated in order to measure the image quality. The proposed system has been developed using DCT algorithm, SPYDER (Python 2.7), ANACONDA2.

Index Terms **- DCT, AES, SPYDER (Python 2.7), ANACONDA2, Compression rate, PSNR, MSE.**

I. INTRODUCTION

Video processing has an increasing demand to integrate video data into telecommunications services, the corporate environment, the entertainment industry, and even at home has made digital video technology a necessity. Video compression is one of best technique in order to save the memory required to storage of media. The large amount of data is required for storage of video. So, to reduce the storage space the technique video compression is used. Video compression is the process of reducing the size of the video by compressing the frame size. It is easy to transmit the video over the transmission media after compressing its size. The compressed media/video consumes less space compared to the original video size. A problem, however, is the data rates of image and video is very large, typically in the range of 150Mbits/sec. The data rates of the image and video which will consumes large amount of bandwidth and storage space in the personal computer systems. Because of this reason, Picture redundancy has been eliminated by developing the video compression standards. By allowing video information to be transmitted and stored in a compact and efficient manner.

Video compression is a type of compression technique which reduces the video file formats size by eliminating redundant and non-functional data from the original video file. The repetitive sounds and images from the video are removed in order to make the video to be compressed. Video compression can be performed by video codec which works on one or more compression algorithms. For example, a video may have the same background, image or sound played several times or the data displayed/attached with video file is not that important. Video compression will remove all the unwanted data to reduce the video file size.

As the compression ratio increases the video quality goes on decreases, hence both the compression ratio and video quality are inversely proportional to each other. The Discrete cosine transform algorithm is used for better video compression and video quality. And also Advanced AES algorithm and scrambling process is used for secured transmission and PSNR and MSE is used to measure the quality of the image obtained after compressing.

II. RELATED WORK

Video compression which is related to the image processing which is widely used in many applications. The main problem of the video is because of its large storage space. The compression technique can be used to decrease the memory size of the media. The proposed system has been developed using Discrete Wavelet Transform (DWT) algorithm, MATLAB, XILINX platform and FPGA SPARTEN 3 board. The algorithm proposed in this paper which saves the memory and also increases the signal to noise ratio [1].

To represent some important information video is considered has most useful media. To represent the data videos and images became most essential approach. The main problem of video is because of its large size and it also contains a lot of redundant information. The proposed system has been developed using Discrete Cosine Transform (DCT) algorithm for compression and it also solves the bandwidth requirement problem [2].

In this paper video compression is done Hybrid (DCT-DWT) algorithm. The two main compression techniques are lossy and lossless used for data compression. Lossy compression is mainly preferred for video compression. The proposed system uses DCT and DWT for compression and it also uses arithmetic coding to achieve more compression and to maintain the video quality

after compression. This proposed system performance can be evaluated using criterion compression ratio, PSNR and mean square error [3].

The size of the data file can be reduced by compressing it is said to be data compression. The two main compression techniques are lossy and lossless used for data compression. Lossy compression is mainly preferred for video compression. The proposed system has to achieve more compression ratio and also to maintain the video quality after compression. No information loss occurs in the lossless compression and in the lossy compression number of bits are reduced hence some amount of loss occurs in the lossy compression. Mainly the compression is done for easy transmission of data/image/video by reducing its size. Later the compressed data can also be decompressed, which simply leads to wastage of time and memory and it will become complex process. The data compression strategy which is designed in this paper will calculate the degree of compression as well as the amount of distortion introduced [4].

Nowadays video processing became more popular and it also requires more memory to store the video. The unnecessary data should be removed to reduce the size of the media. To preserve the quality of the video motion vectors are estimated which is heart of video processing. In this paper WBM and SPIHT algorithms are used to compress the video and it also measures some parameters like mean squared error (MSE), peak signal to noise ratio (PSNR), compression ratio and structural similarity index (SSIM) [5].

Video streaming services have more demand nowadays due to the development in the field of network and multimedia technology. Video is one of the most important media in internet. Because of some conditions in the transmission media, the video quality decreases which is not satisfied by the people. Hence, the proposed system uses MDP for better compression and also increases the quality of the video under limited bandwidth [6].

III. PROPOSED METHODOLOGY

Video compression which plays a very important role in many digital video processing applications. Video compression which reduces and removes the redundant data and it minimizes the storage space in the system. In this project video compression is done by using Discrete Cosine Transform (DCT) algorithm. Video has become one of the most useful media in order to represent some of the important information. Videos and images are the most essential approaches to represent the data. The problem occurs with media is because of its large size and it also contains a lot of redundant information. In this project video compression is done by using Discrete Cosine Transform (DCT) algorithm.

Before applying the DCT algorithm to the video it needs to be converted into individual frames and then the DCT algorithm is applied to each frame and compression is done. Later the compressed frames are encrypted and transmitted, at the receiver encrypted frames are decrypted. Encryption and Decryption is done using Advanced AES algorithm and Scrambling process. The proposed method is used for secured transmission, better compression rate and also to obtain better video quality.

Two dimensional DCT is considered because the image is represented in two dimensional matrix. For N x N input sequence 2-D DCT is shown below in equation (1).

$$D_{DCT}(i,j) = \frac{1}{\sqrt{2N}} B(i)B(j) \sum_{x=0}^{N-1} 1 \sum_{y=0}^{N-1} M(x,y) \cos\left[\frac{2x+1}{2N} i\pi\right] cos\left[\frac{2y+1}{2N} j\pi\right] \quad (1)$$

Where,

$$B(u) = \begin{cases} \frac{1}{\sqrt{2}} \; if \; u = 0 \\ 1 \; if \; u > 0 \end{cases}$$

The quantization can be achieved by dividing each element of the transformed data by corresponding element in the quantization matrix Q and then rounding it to the nearest integer value as shown below in equation (2).

$$D_{quant}(i,j) = round\left(\frac{D_{DCT}(i,j)}{Q(i,j)}\right) \quad (2)$$

The output data can be reconstructed by performing rescaling and de-quantization shown below in equation (3).

$$D_{dequant}(i,j) = Q(i,j) \times D_{quant}(i,j) \quad (3)$$

3.1 Performance Parameters

The output of the video compression is calculated based on the amount of compression ratio and the PSNR. The two error metrics namely MSE and PSNR are available to measure the quality of the compressed frames. Peak signal to noise ratio (PSNR) is one of the important parameter to check the quality of the image. The compression ratio is calculated by dividing the compressed

frame size to the original frame size, which is to measure the amount of data compressed by comparing both the compressed and original frames. MSE should be calculated before measuring the PSNR. The following are the equations to calculate the compression ratio, MSE, PSNR.

$$\text{Compression ratio} = \frac{\text{Compressed frame size}}{\text{Original frame size}} \times 100 \quad (4)$$

$$\text{MSE} = \frac{1}{m*n}\{\sum_{m=1}^{M}\sum_{n=1}^{N}(X1(m,n) - X2(m,n))\text{^}\,2\} \quad (5)$$

X1 is the original image and X2 is the reconstructed image.

$$\text{PSNR} = 10\log_{10}\left|\frac{255}{\sqrt{MSE}}\right| \quad (6)$$

The flow diagram below shows the entire process of proposed methodology.

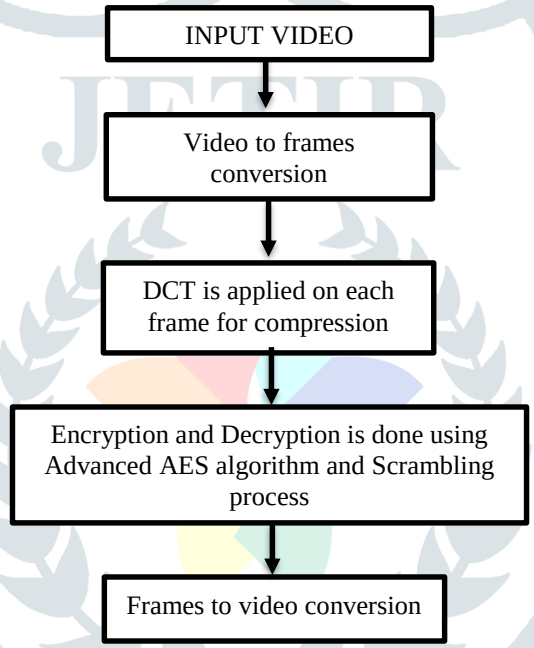

Fig 1: Video compression process

IV. EXPERIMENTAL RESULTS

The input video is compressed after converting it into frames and those converted frames are encrypted and decrypted. The output of compressed frames are converted into video then encrypted and decrypted as shown below in the figure.

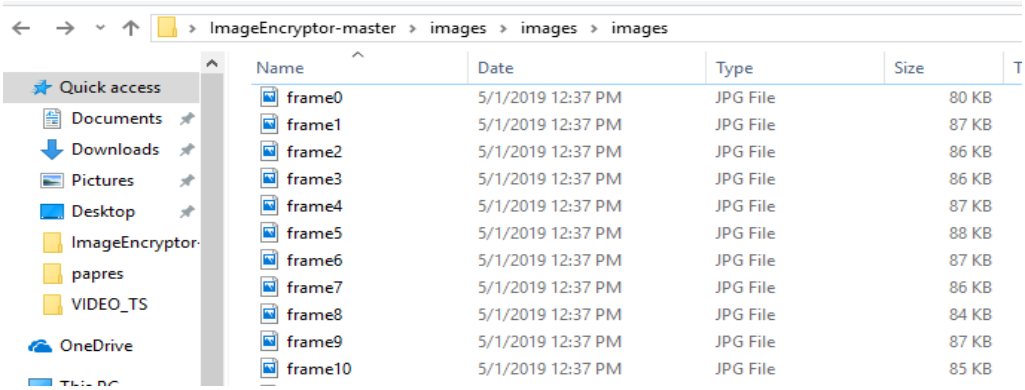

Fig 2: Input video to frames conversion

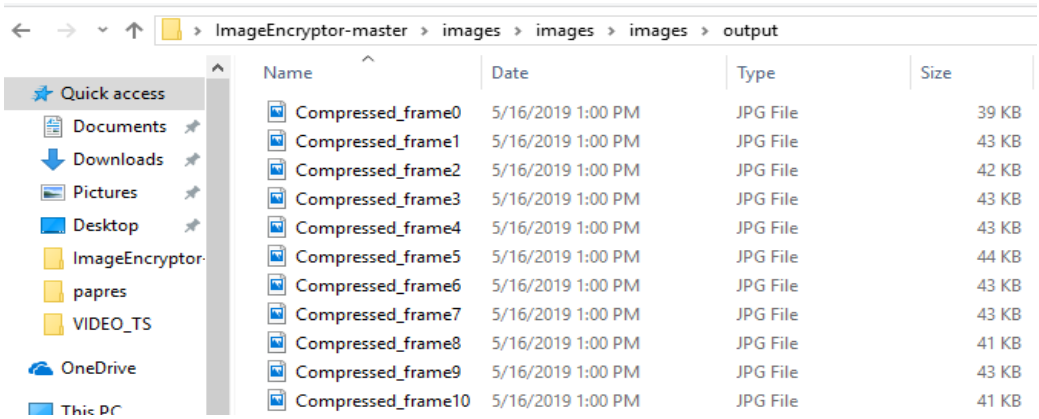

Fig 3: Compressed frames

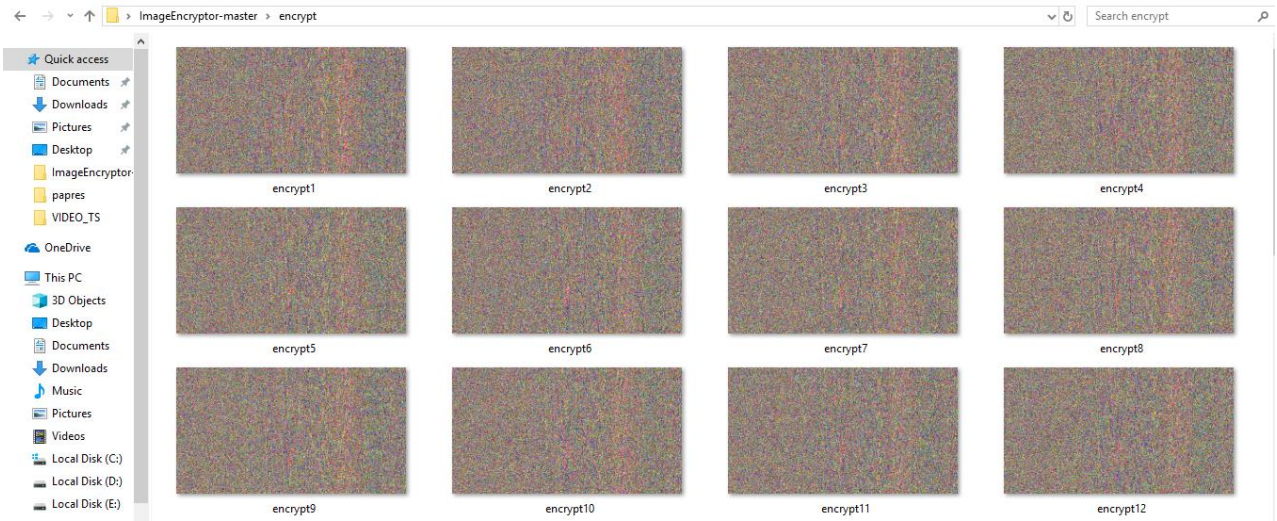

Fig 4: Encrypted images

Fig 5: Decrypted images

4.1 RESULT ANALYSIS

The table below shows the detailed output of the proposed method by displaying the values of original frame size, compressed frame size, compression ratio, MSE and PSNR values.

Table 1: Result analysis

Parameter	Frame 1	Frame 2
Original frame size (KB)	87	86
Compressed Frame Size(KB)	43	42
Compression Ratio (CR)	49.42%	48.83%
MSE	9.84	9.84
PSNR	38.19	38.19

V. CONCLUSION

In this paper the proposed system uses Discrete Cosine Transform (DCT) algorithm for video compression and Advanced AES algorithm and Scrambling process for encryption and decryption. Initially the input video is converted into frames and DCT is applied on each frame for compression and then those frames are then encrypted and converted into video. And encrypted frames are then decrypted and converted into video. Finally compressed frames are then converted into video. The proposed system gives the more compression ratio and better video quality by secured transmission by encrypting and decrypting the video. It also gives the better mean square error (MSE) and peak signal to noise ratio (PSNR). This system which improves the quality of the compressed video along with the better compression ratio.

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