# Review of Discrete Cosine Transform, Accordion Discrete Cosine Transform, Discrete Wavelet Transform and Accordion Wavelet Transformation for Video Compression

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***Abstract***- *In this paper video has compressed using discrete cosine transform (DCT), Accordion Discrete Cosine Transform (ACC-DCT), Discrete Wavelet Transform (DWT) and Accordion Discrete Wavelet Transform (ACC-DWT) method are reviewed. Video compression uses modern coding techniques to reduce redundancy in video data.*

*Most of the video compression algorithms and codec combine spatial image compression and temporal motion compensation. The main objective of this paper is to review all the transformation technique and that technique used for video applications to reduce the amount of video data for storing or transmission purposes without affecting the visual quality. In this paper analysis of compression using Discrete cosine transform(DCT),Accordion Discrete Cosine Transform(ACC-DCT),Discrete wavelet transform (DWT) and Accordion Wavelet transform (ACC-DWT) by selecting proper threshold method better result for PSNR have been obtained.*

***Keywords***- Discrete cosine transform, Accordion Discrete Cosine Transform, Discrete Wavelet transform, Accordion Discrete Wavelet transform, PSNR and video compression.

## I. INTRODUCTION

The data quantity is very large for the digital video and the memory of the storage devices and the bandwidth of the transmission channel are not infinite, so reducing the amount of data needed to reproduce video saves storage space, increases access speed and is the only way to achieve motion video on digital computers.

## II. MPEG

Correlation improves compression. This is a recurring theme in all of the approaches we have seen; the more effectively a technique is able to exploit correlations in the data, the more effectively it will be able to compress that data. This principle is most evident in MPEG encoding. MPEG compresses video streams. In theory a video stream is a sequence of discrete images. In practice, successive images are highly interrelated. Barring cut shots or scene changes, any given video frame is likely to bear a close resemblance to neighboring frames. MPEG exploits this strong correlation to achieve far better compression rates than would be possible with isolated images. Each frame in an MPEG image stream is encoded using one of three schemes:

**I-frame** or intra-frame, are coded as isolated images.

**P-frame** or predictive coded frame, are based on the previous I- or P-frame.

**B-frame** or bidirectional predictive coded frame are based on either or both the previous and next I or P-frame.

## III. VIDEO QUALITY MEASURE

In order to evaluate the performance of video compression coding, it is necessary to define a measure to compare the original video and the video after compressed. Most video compression systems are designed to minimize the mean square error (MSE) between two video sequences Ψ1 and Ψ2, which is defined as

$$MSE = \sigma_e^2 = 1/ N\Sigma_t \Sigma x,y[ \Psi_1(x,y,t) - \Psi_2(x,y,t)]$$

Where N is the total number of frames in either video sequences. Instead of the MSE, the peak-signal-to-noise ratio (PSNR) in decibel (dB) is more often used as a quality measure in video coding, which is defined as

$$PSNR=10\log_{10}(2^n-1)^2/MSE$$

Where $(2^n-1)^2$ is the square of the highest-possible signal value in the image and n is the number of bits per image sample.

PSNR can be calculated easily and quickly and is therefore a very popular quality measure, widely used to compare the 'quality' of compressed and decompressed video images. For a given image or image sequence, high PSNR usually indicates high quality and low PSNR usually indicates low quality. However a particular value of PSNR does not necessarily equate to an 'absolute' subjective quality.

## IV. WAVELET COMPRESSION

JPEG and MPEG decompose images into sets of cosine waveforms. Unfortunately, cosine is a periodic function; this can create problems when an image contains strong a periodic features. Such local high-frequency spikes would require an infinite number of cosine waves to encode properly. JPEG and MPEG solve this problem by breaking up images into fixed-size blocks and transforming each block in isolation. This effectively clips the infinitely-repeating cosine function, making it possible to encode local features. An alternative approach would be to choose a set of basis functions that exhibit good locality without artificial clipping. Such basis functions, called "wavelets", could be applied to the entire image, without requiring blocking and without degenerating when presented with high-frequency local features.

## V. ACCORDION REPRESENTATION

Table 1. Image1

| | | | | | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 2 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 |

Table 2. Image2

| | | | | | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 2 | 2 | 2 | 2 | 2 |
| 4 | 2 | 2 | 2 | 2 | 2 |
| 5 | 2 | 2 | 2 | 2 | 2 |

Table 3. Accordion Image

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 2 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |
| 3 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |
| 4 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |
| 5 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |

Table 4. Comparison among DCT, ACCORDIAN DCT, DWT and ACCORDIAN DWT Technique

| **Video** | **Methods** | **Compression rate** | **PSNR** |
|---|---|---|---|
| Vipmen Video | DCT | 35.8446 | 9.675 |
| | ACC-DCT | 37.1403 | 13.8992 |
| | DWT | 35.1746 | 9.005 |
| | ACC-DWT | 37.4403 | 30.1822 |
| Viptraffic Video | DCT | 31.5423 | 8.6972 |
| | ACC-DCT | 33.7563 | 9.9415 |
| | DWT | 30.8723 | 8.0272 |
| | ACC-DWT | 33.9563 | 25.5415 |
| Scene video clip | DCT | 28.6835 | 6.2561 |
| | ACC-DCT | 30.1161 | 7.2538 |
| | DWT | 28.0135 | 5.6161 |
| | ACC-DWT | 30.2161 | 21.2538 |

## VI. CONCLUSION

Accordion transformation converts the spatial and temporal correlation of the video signal into a high spatial correlation. This technique transforms each group of pictures (GOP) into one picture with high spatial correlation. The main advantage of applying Discrete Wavelet Transform (DWT) is to achieve high compression while maintain reconstruction quality. Since, the large data block size is considered compared to Accordion-Discrete Cosine Transform (ACC-

DCT) there will be less probability of occurrence of the blocking artifact. The compression ratio was found more for those videos having less motion and vice versa. Many experimental tests have been conducted to prove the technique efficiency especially in high bit rate and with slow motion video. Since motion is low, temporal redundancy is high and it is expected that ACC-DWT becomes efficient. However compression rate is not only the main issue we should also care about error in original and reconstructed video. These errors cannot be removed because of losses during quantization and DCT coefficient approximation. But they can be reduced to meet the human eye perception. From

Table1 we can observe that using ACC-DWT based compression we are getting higher PSNR in comparison to ACC-DCT, DWT and DCT compression.

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