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A Proficient Video Compression Method Based on DWT & HV Partition Fractal Transform Function

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Abstract : Transform based function play vital role in video compression. In this paper used two transform functions for video compression one is discrete wavelet transform function and other is fractal transform function. The discrete wavelet transform function is very promising image compression technique. Instead of discrete wavelet transform fractal transform is fast image compression technique. Here both wavelet transform function and fractal transform function used for video compression. The H-V partition technique is used for fast processing of video data in terms of row and column. The process of compressing produce good PSNR value and the compression ratio instead of DWT transform function. The DWT transform function creates group of frames in terms of layer for the processing of lower and higher band data of process video. The major contribution of H-V partition technique in video compression due to represents of domain and range blocks for the processing of video components. The processing of transform generates the similarity property of range and the compression process is fast. The both methods DWT and H-V partition techniques simulated in MATLAB software and measure some standard parameter such as PSNR, Compression ratio, encoding time, and MSE.

Keywords: - **Video Compression, DWT, Fractal Transform, H-V partitioning, MATLAB, MSE**

I. Introduction

Fractal videocompression has turned into an acknowledged strategy for compacting still image. The primary thought behind fractal compression is that it misuses the self-comparability exhibit in videos. The fractal video compression is a lossy compression strategy. It functions admirably for recordings with enduring foundation rather than persistently evolving foundation [i, ii]. Fractal Compression is a lossy compression strategy for computerized video, considering fractals. The strategy is most appropriate for surfaces and common videos, depending on the way that parts of a video frequently take after different parts of a similar video. Fractal calculations change over these parts into scientific information called "fractal codes" which are utilized to reproduce the encoded video. Square Motion Compression utilizing settled measured pieces has disservices that vast squares may neglect to coordinate the slight movement in an arrangement, particularly along the moving edges, while little pieces require more overhead moreover[iii,iv]. For the most part, the items in movement have distinctive sizes and shapes. Keeping in mind the end goal to conquer the impediments of the conventional settled size square movement compression(FSBMC), different procedures were proposed. Accomplishing, both great video compression proportion and video quality is a clashing necessity, with settled size piece coordinating (FSBM). The issue can be overwhelmed by factor measure square coordinating movement estimation procedure (VSBME). In this, littler squares can be utilized to depict complex movement while bigger pieces can be utilized where the video content is stationary or experiencing uniform movement, additionally the number of pieces and bit rate are settled. The quadtree portrayal of a video gives a various levelled see in which the root hub speaks to the entire video. In a two-level quadtree structure, one may start with a consistent apportioning of 8 x 8 pieces. For each range obstruct, the space pool is scanned for the best match. On the off chance that the exactness of the coordinated falls inside a slightest resistance, it is acknowledged [viii, ix]. On the off chance that it isn't, the range square is subdivided, and a scan is started for each sub-piece. The execution of fractal video compression depends for the most part on four parameters. These parameters are the encoding speed, computational many-sided quality, Signal to Noise Ratio (PSNR) (speaking to the quantitative visual nature of the video arrangement), lastly the bit-rate. Diminishing the computational many-sided quality is the essential obstacle. They have to expand the encoding speed. The significant disadvantage is that fractal encoding is perplexing and tedious to scan for the best-coordinating piece in a huge pool of area squares [v, vi]. As plunging the whole video into space squares, put away as area pool, turns into an issue. Since area pool squares are covering pieces. On the off chance that there is vast no. of area squares, at that point required space will be progressively and this truly humiliates the fractal video coding strategy's. In this paper used H-V partition technique for the encoding of video. The rest of paper is organized as follow. In section II describe the discrete wavelet transform function. In section III describe the H-V partition and fractal transform function, in section IV describe the simulation and result analysis and finally conclude in section V.

II. Discrete Wavelet Transform

For the decomposition and compression of digital multi-media data transform function and resolution of transform-based function play a vital role. The function of transform level proceeds according to the dimensions of digital data, if the digital data is two dimensional used 2D transform function. The processing of 2D-DWT in layers decomposition and creates the layer value in terms of approximate and details. The value of approximate is further processing and the value of details is preserve. The processing of transform function represents in from of frequency domain. The 2D-DWTrepresents an image pixel value in terms of high frequency and low frequency such as $\Psi^{LH}, \Psi^{HL}, \Psi^{HH}$ and scaling functions ϕ^{LL} that form an ortho-normal basis for $L^2(R^2)$. Given a J-scale DWT, an image $x(s,t)$ of NxN is decomposed as

$$x(s,t) = \sum_{k,i=0}^{N_j-1} u_{j,k,i}\, \phi^{LL} j,k,i(s,t) + \sum_{B\in B} . \sum_{j=1} . \sum_{k,i=0}^{N-1} W^B j,k,i\, \Psi^B j,k,i(s,t) \quad (1)$$

with,

$$\Phi^{LL} j,k,i(s,t) \equiv 2^{-\frac{j}{2}} \phi(2^{-j} s - k, 2^{-j} t - i)$$
$$\Psi^B j,k,i(s,t)\ \Psi^B j,k,i(s,t) \quad (2)$$
$$\equiv 2^{-\frac{j}{2}} \phi(2^{-j} s - k, 2^{-j} t - i), \qquad B \in \mathrm{B}, \mathrm{B}$$

$\{LH, HL, HH\}$, and $N_j = N/2^j$. In this paper LH, HL and HH are called wavelet or DWT sub-bands. $u_{j,k,i} = \int\int x(s,t)\phi_{j,k,i}\, ds dt$ is a scaling coefficient and

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$W^B j,k,i = \int\int x(s,t)\Psi^{B}{}_{j,k,i}\, ds dt$ Denotes the (k,i)th wavelet coefficient in scale j and sub-band B. Fig. shows the scaling concept in wavelet transform.

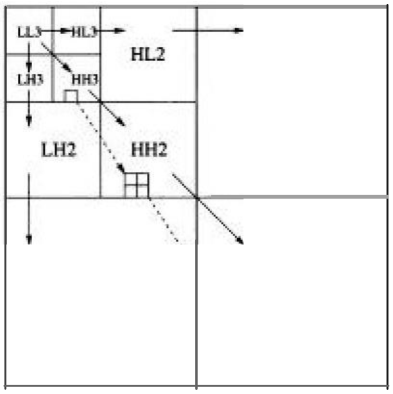

Figure 1: Scaling Concept in Wavelet Transform

III. Fractal Transform and H-V Partitioning

The Transform function assumes an imperative part in computer vision. In group of Transform function gives one part is called fractal Transform function. Essentially, the fractal transform function is loosy image compression procedure. Be that as it may, in this function fractal Transform function fill in as lossless image compression. The fractal Transform function utilized the property of similitude. The property of likeness list consolidated the information in from of preparing as far as compression. by and large, the Fractal calculation makes full utilization of the attributes of wavelet coefficients including the vitality bunching and the vitality constriction alongside the expansion of versatility. Besides, purchasing consolidating the quad tree segment with the bit-plane encoding, this technique can about accomplish a similar packing execution with the SPIHT. Be that as it may, there still exists some transform to be done with respect to the accomplishing pace and memory use regardless of its Coding freely, quick coding rate et cetera. Initially, we characterize a centrality test for coefficients [xiv, xv, xvi]

$$Sn(T) = \begin{cases} 1, Max\ (i,j) \in T|Ci,j| \geq 2^n \\ 0, other \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (1)$$

The prediction of transform gives the value of 1 estimate the value of similarity. Otherwire non-similar

In a HV partition a rectangular range square can be part either on a level plane or vertically into two littler rectangles. A choice about the split area must be made. While embraces a model in view of edge area, we take after and propose to part a rectangle with the end goal that an estimation by its DC segment (DC segment of a piece is characterized here as the square whose pixel esteems are equivalent to the normal power of the square.) in each part gives an insignificant aggregate square mistake [i]. We anticipate that fractal coding will deliver moderately little collection mistakes with this decision since Approximation by the DC segment alone will as of now give little wholes of squared blunders by plan of the part conspire, and for the guess of the dynamic piece of the range squares we have more areas accessible, if the range piece fluctuations are low [iii].

The H-V partition technique proceed the video data for the process of encoding in terms of domain and Range block in terms of column for the encoding in terms of horizontal and vertical column of video data. The video data represents in terms of domain D and P (HV) is encoding partition.

- $D - P\ (HV)$: define the relation of domain and partition column horizontal and vertical
- $encoding\ block\ (rectange - P(HV))$ of video partition data of all number of blocks $nrectangle - encode_k(p,o) = \max\{D - P \leq 3\}$ (2)

  Where $ek(p,o)$ is the similar block of encode and transform between?
- $sub\ block\ partion\ accoding\ to\ H - V\ partition$

$$SB(e) = \left(\frac{1}{N}\sum_{0\in N_{(H,V)}} D - encode_k(p,o)\right)^{-1}, \qquad (3)$$

  where $N_{(H,v)}$ is the set of N blocks of video frames.
- $now\ finally\ encode$

$$GOP(N) = \sum_{0\in N_{(p,k)}} SB(e) \qquad (4)$$

IV. Experimental Results

In this section analyzed the performance of DWT transform function and H-V partition encoding technique for the processing of video compression. Here used two video one is dancing video and other is coil video, both video obtained from CV vision library for experimental result. For the evaluation of the performance used some standard parameters such as PSNR, MSE, compression ratio and encoding time of video. The value of PSNR shows that the information of the quality of video. The value of compression ratio shows that the value of fast encoding process of video. All process describes here.

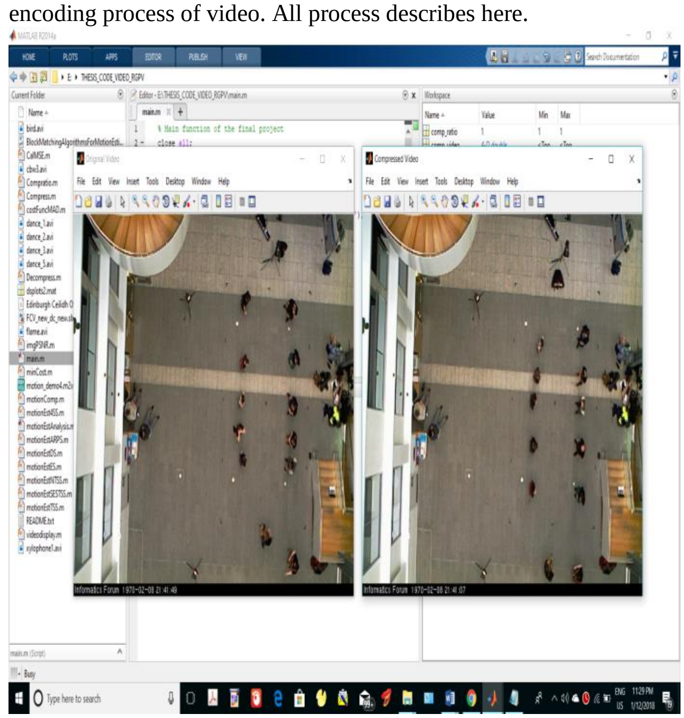

Figure 2: Above window show that the original video and compressed video view in our simulation using DWT method when we load the dancing video in our simulation.

Also get the result of compression of PSNR, Compression Ratio, Mean Square Error and Encoding time.

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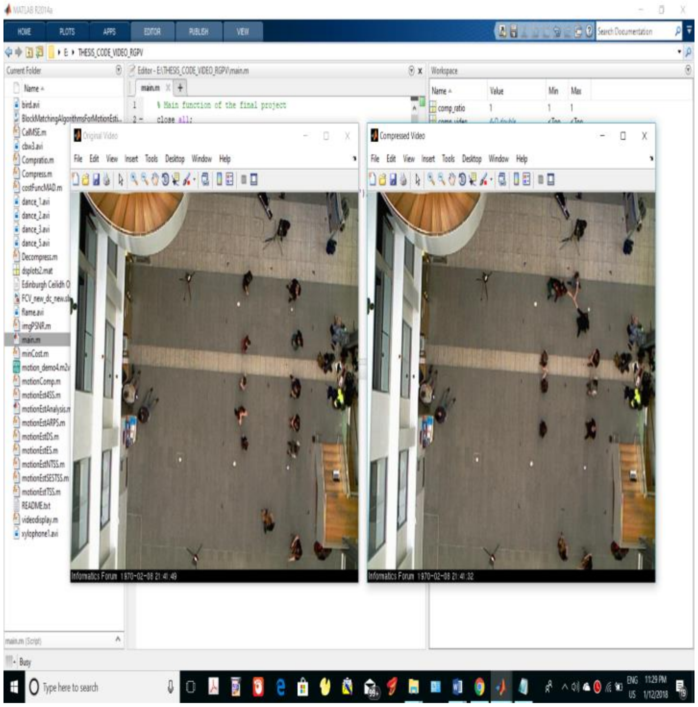

Figure 3: Above window shows that the original video and compressed video view in our simulation using HV Partition method when we load the dancing video in our simulation.

Also get the result of compression of PSNR, Compression Ratio, Mean Square Error and Encoding time.

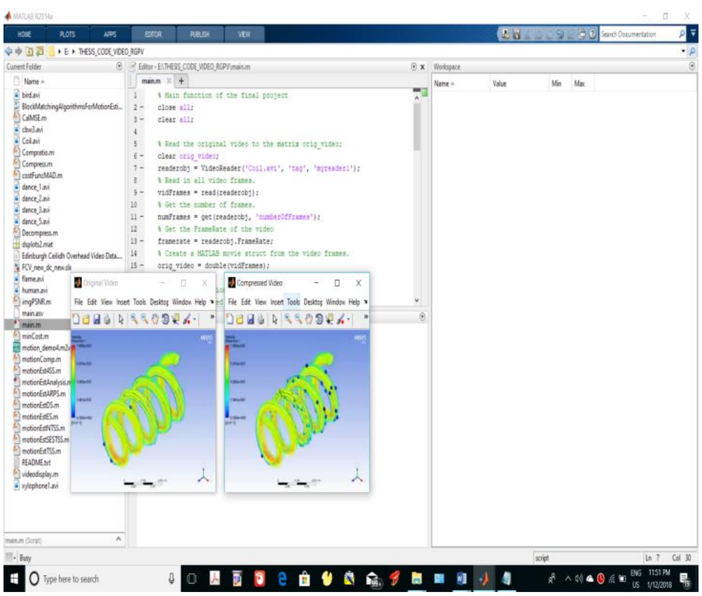

Figure 4: Above window shows that the original video and compressed video view in our simulation using DWT method when we load the Coil video in our simulation.

Also get the result of compression of PSNR, Compression Ratio, Mean Square Error and Encoding time.

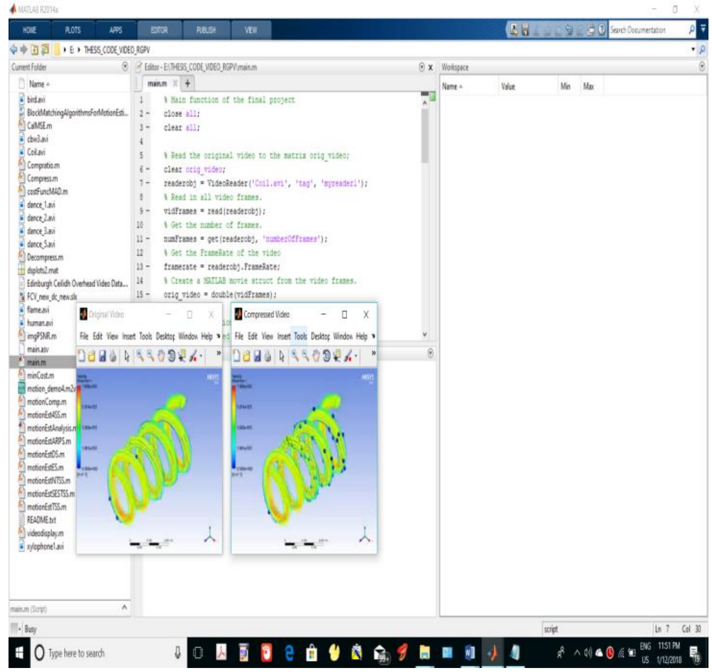

Figure 5: Above window show that the original video and compressed video view in our simulation using HV Partition method when we load the Coil video in our simulation.

Also get the result of compression of PSNR, Compression Ratio, Mean Square Error and Encoding time.

RESULT AND PERFORMANCE ANALYSIS

	DWT	HV Partition
Compression Ratio	0.77	0.81
MSE	12.34	11.09
PSNR	24.34	25.14
Encoding Time	1.81	1.90

Table 1: Show that the comparative analysis for dancing.avi video using DWT and fractal HV Partition method . We get the comparative resultant between compression ratio, PSNR, MSE and Encoding Time for all methods used in our implementation.

	DWT	HV Partition
Compression Ratio	0.56	0.81
MSE	10.25	9.11
PSNR	24.34	24.64
Encoding Time	0.50	0.59

Table 2: Show that the comparative analysis for Coil.avi video fractal compression using using DWT and fractal HV Partition method .

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We get the comparative resultant between compression ratio, PSNR, MSE and Encoding Time for all methods used in our implementation.

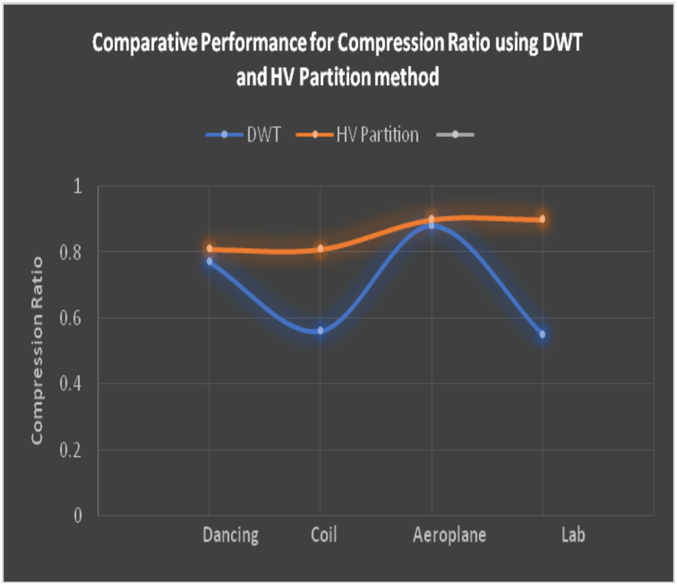

Figure 6: Shows the comparative performance for compression ratio using DWT and HV Partition method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

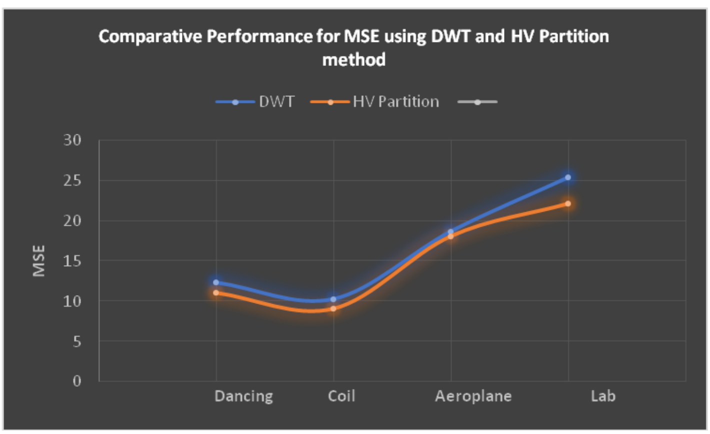

Figure 7: Shows the comparative performance for MSE (Mean Square Error) using DWT and HV Partition method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

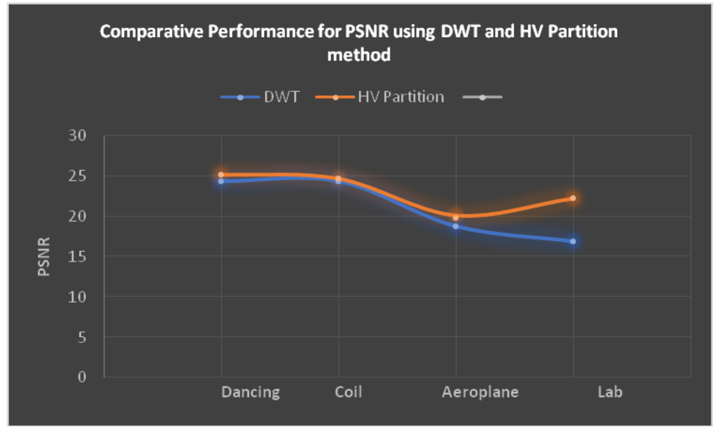

Figure 8: Shows the comparative performance for PSNR (Peak Signal Noise Ratio) using DWT and HV Partition method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

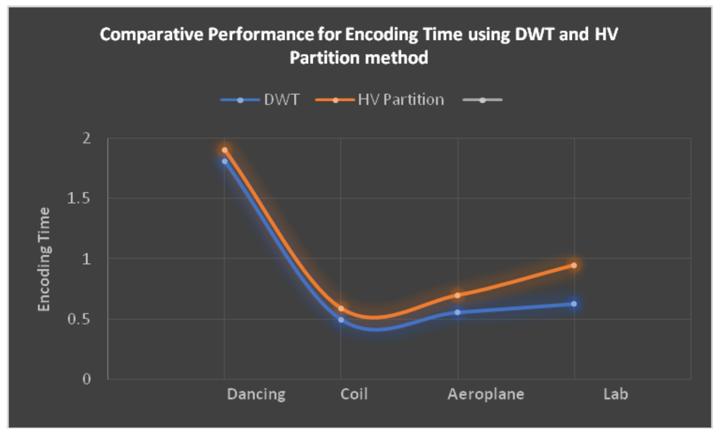

Figure 9: Shows the comparative performance for Encoding Time using DWT and HV Partition method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

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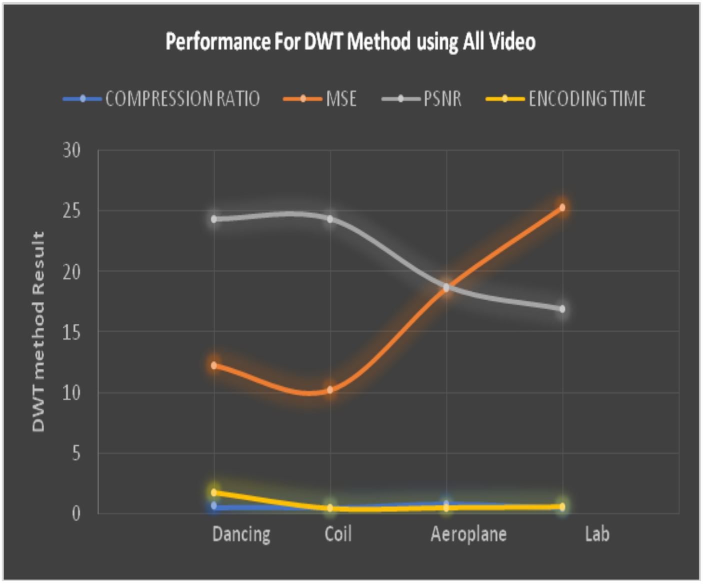

Figure 10: Shows the individual performance for Compression ratio, MSE, PSNR and Encoding time using DWT method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

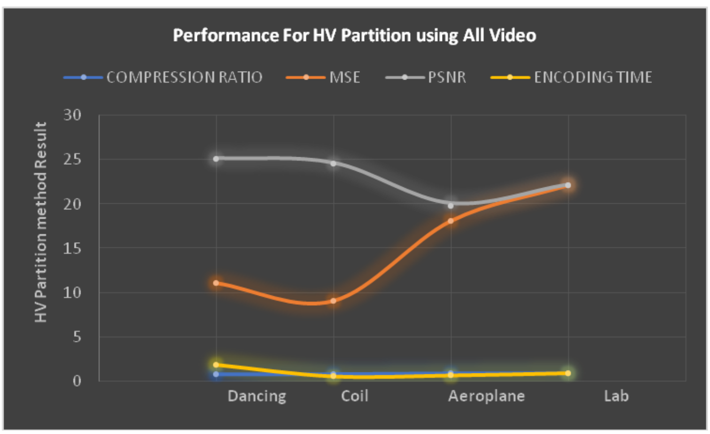

Figure 11: Shows the individual performance for Compression ratio, MSE, PSNR and Encoding time using HV Partition method with Dancing.avi, Coil.avi, Aeroplane.avi and Lab.avi video.

V. Conclusion & Future Work

In this paper present the performance of video compression technique of two different methods such as DWT and H-V encoding technique using fractal transform function. The process of video compression is very slow due to large number of diverse components of frames and pixel. In the process of compression, the estimation of motion and frames decide the performance of video compression. The DWT transform function decodes the video into number of layers and proceed for the process of encoding. The DWT transform function faced problem of distortion of layers, due to this reason the value of PSNR is decrease. The H-V partitioning encoding technique is better encoding technique instead of DWT methods and increase the value of PSNR and compression ratio. For the betterment of searching of common video symmetry used Swarm algorithm in future.

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