IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-6, Issue-1 E-ISSN: 2347-2693

Enhance the Performance of Video Compression Based on Fractal H-V Partition Technique with Particle Swarm Optimization

Shraddha Pandit[1*], Piyush Kumar Shukla[2], Akhilesh Tiwari[3]

[1*]University Institute of Technology, RGPV, Bhopal, India
[2] Department of Computer Science & Engineering, UIT-RGPV Bhopal
[3]Department of CSE & IT, Madhav Institute of Technology & Science (MITS), Gwalior, M.P. (India)

**Corresponding Author: svpandit_pict@yahoo.co.in*

Available online at: www.ijcseonline.org

Received: 10/Dec/2017, Revised: 22/Dec/2017, Accepted: 14/Jan/2018, Published: 31/Jan/2018

Abstract— The searching of coefficient and blocks in video compression is important phase. For the searching of blocks and coefficient used zig-zag and some other random searching technique for symmetry of blocks. In this paper used particle swarm optimization for the searching of block coefficient in domain and range of fractal transform function. The particle swarm optimization enhances the searching capacity of encoder for the process of compression. The particle swarm optimization decides two dual functions one for the mapping of symmetry and other is mapping of video encoded block. For the process of fractal transform encoding used H-V partition technique. H-V partition technique mapped the data in terms of range and domain for the processing of video compression. The H-V partition process creates multiple rectangle blocks the processing of video. The process of video compression methods simulated in MATLAB software and used some standard parameters for the evaluation of compression results.

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

I. INTRODUCTION

With the development of multimedia technology, video compression has become more and more important. The high definition of video required huge amount of storage space and large amount of bandwidth for the transmission of video. The most straightforward way to encode a video is to split it into different blocks, and compress them separately by treating each block as a single domain relation of fractal video coding. Procedure of fractal video unravelling resembles other fractal disentangling strategy [1, 2, 3]. To start with, it needs to peruse the fractal code from packed document and introduces a subjective video as indicated by measure data of the first video. At that point, we should separate the underlying video outlines into area obstructs as indicated by the position of space hinder in fractal code. Therapist change and isometric change are required to change an area obstruct into a square comparative as range piece [4, 5, 6]. The H-V partition blocks encoding suffer the process of searching and scanning of component for the mapping of data. Now a day's various authors focus on frequency based video compression technique. the frequency based video compression technique used various transform function such as FFT, DCT and many more transform function. All these transform function gives better video compression technique in consideration of video quality value [7.8.9]. But the factor of quality compromised with compression rate and compression ratio. For the improvement of compression ratio and compression rate used swarm intelligence technique. The combination of swarm intelligence and fractal transform increase the compression speed of digital video data. The combination of fractal and swarm intelligence gives the new area of video compression. The combined model focused in terms of redundant component of video and non-redundant component for video compression. In this paper proposed a particle swarm along with fractal transform function for the processing of video compression [18,19]. The proposed algorithm is also called extension of H-V partition compression technique and fractal transform compression technique. The particle swarm optimization reduces the searching space of partition methods and enhances the compression ratio and quality of image. The rest of paper is organized as follow. In section II describe H-V Partition Technique. In section III describe particle swarm optimization, in section IV describe methods for mapping of H-V Partition technique. In section V describe experimental result and result analysis and finally consider the conclusion in section VI.

II. H-V PARTITIONING TECHNIQUE

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 [22]. 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 [3].

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[23].

- $D - P(HV)$: 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?
- $sub\ block\ partion\ accoding\ to\ H - V\ partition$

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

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

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

III. PARTICLE SWARM OPTIMIZATION

Particle swarm optimization is dynamic population-based searching technique. The process of working define in manner of particle of swarm optimization is birds fork. The global best solution is better result in case of optimality. The process of optimization apply on blocks searching and mapping parameter for the process of encode. The process of particle of swarm optimization describe as. In Particle Swarm Optimization [17] streamlines a target work by attempted a populace-based inquiry. The populace contains conceivable arrangements, named particles, which are similitude of winged animals in groups. These particles are indiscriminately introduced and openly fly over the multi-dimensional look for space. Amid flight, every molecule refreshes its own particular speed and position in view of the best involvement of its own and the whole populace. The distinctive advances engaged with Particle Swarm Optimization Algorithm are as per the following [18]:

A. : The mapping of particles define in given condition.

B. : If the data point changes the value of velocity is updated, by the given equation.

$$v_i = v_i + c_1R_1(p_{i,best} - p_i) + c_2R_2(g_{i,best} - p_i) \quad ....(1)$$

Here some variable parameter describe as c1 is constant acceleration parameters, pbest is local best and gbest is global best and R1, R2 is random update variable of iteration.[19].

C. : The value of particle change the updated velocity.

$p_i = p_i + v_i$...(2)

The updates of velocity in define range of constraints.

D. : Final update the solution met the define condition.

$$p_{i,best} = p_i \quad if\ f(p_i) > f(p_{i,best})$$

$$g_{i,best} = g_i \quad if\ f(g_i) > f(g_{i,best}) \quad ...(3)$$

The value of f(x). is final optimal solution.

E. : Finally update the condition and achieve optimal solution in terms of gbest=pbest and terminate the process of iteration.

IV. MAPPING METHOD

(Mapping of H-V partition with PSO-Called ITT method)

Given $D \in \Re^i$th range blocks mapped the data according to their range blocks and the range block data of partition mapped into number of particles as PH (horizontal particle), PV (vertical particle) and PHV (horizontal and vertical particle). The mapping of particle reduces the searching time of blocks mapping and increase the blocks symmetry. The process of mapping describes here in terms of algorithm1 and algorithm 2.

Algorithm 1. (Mapping of blocks with particle)

1. Input: H-V partition blocks and random particle value for the mapping
2. Output: PH, PV, PHV all particle in terms of vertical, horizontal and combination.
3. Estimate $N_{(PH)}$and $D - R(H - V)$
4. for all $N \in D_{(PV)}$do
5. measure$diifrence - v(PHV, R)$ using R reference frames of blocks
6. end for
7. $PH \leftarrow PR_{V)}\{the\ value\ of\ vertical\ coeeficents$
8. for all $D \in PHV$ and $encode \in PH$ do
9. space s$-p(V)$ and $D - R(V)$
10. if $D\ R_{(hv)}$then
11. $space\ s \leftarrow s \cup \{D\}$
12. end if
13. end for
14. for all $D \in s$do

15. space $phv(R)$ and $phv(\{D\})$
16. end for
17. Estimate sR_B and PHV
18. return PHV

Algorithm 2. (Encode Particle as Code)

1. Input: value of particle $P = \{P_1, \ldots \ldots, P_n\}$
   Sub blocks of rectangle map in code
2. Output: set of $encode = \{phv(p1), \ldots \ldots \ldots, phv(pn)\}$blocks
3. $i \leftarrow 0;$ {no blocks
4. for all $D \in R$do
5. $PHV(S)$ ←Encode(PV)
6. If reference blocks mapped with partition blocks
7. $(s, r^i) \leftarrow D - p\,(all)$
8. for all $S \in R$ do
9. measure $totalblock - p\,(v), p(h), p(hv)$
10. end for
11. return $encode\ block$

V. Experimental Results

In this section analyzed the performance of H-V partition and H-V partition mapping technique (mapping of PSO) for the processing of video compression. Here used three video one is airplane video, cycle video and other is coil video. All videos are obtained from CV vision library for experimental results. For the evaluation of the performance used some standard parameters such as PSNR, MSE, compression ratio (CR) 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.

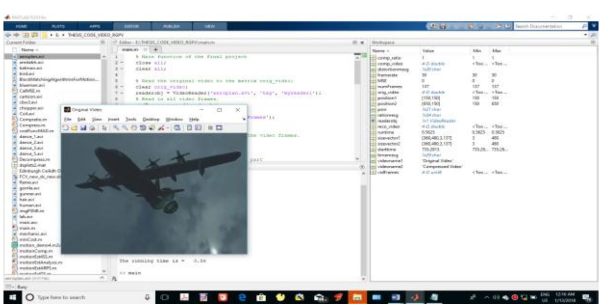

Figure1: Shows the original aeroplane.avi video views in simulation using H-V method.

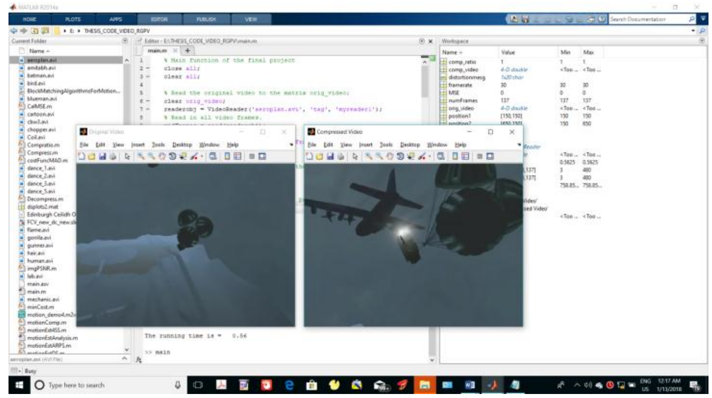

Figure 2: Shows the original and compressed view of aeroplane.avi video in simulation using ITT (Mapping of PSO) method.

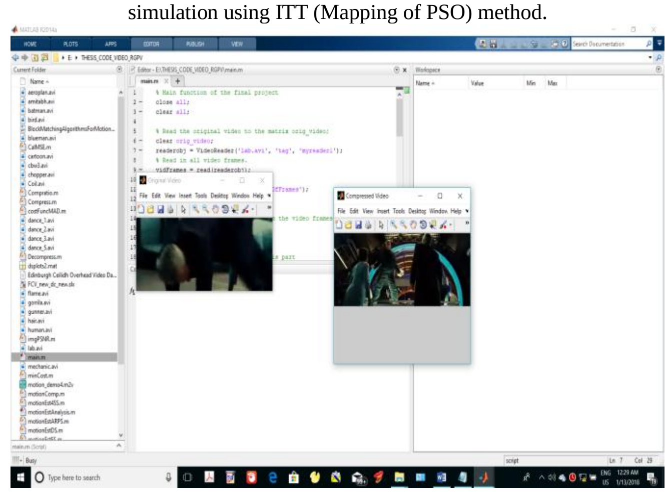

Figure3: Shows the original and compressed view of lab.avi video in simulation using H-V method.

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

RESULT AND PERFORMANCE ANALYSIS

Table 1: Shows the comparative analysis of aeroplane.avi video using fractal H-V and ITT method.

	H-V Partition Method	ITT (mapping of PSO) Method
Compression Ratio	0.88	1.22
MSE	18.64	17.01
PSNR	18.78	21.07
Encoding Time	0.56	0.86

Table 2: Shows the comparative analysis of lab.avi video using fractal H-V and ITT method.

	H-V	ITT (mapping of PSO)
Compression Ratio	0.55	1.87
MSE	25.33	21.22
PSNR	16.89	24.07
Encoding Time	0.63	1.20

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

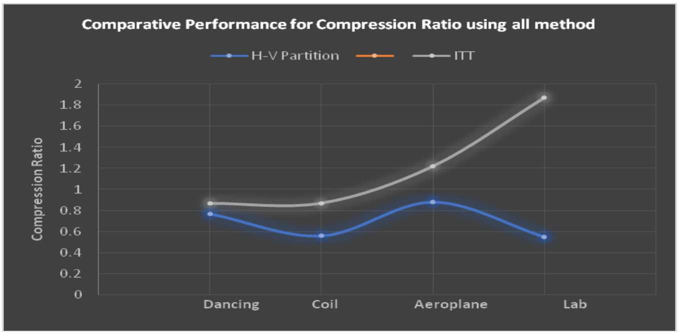

Figure 5: Shows the comparative performance of compression ratio using H-V partition and ITT method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video

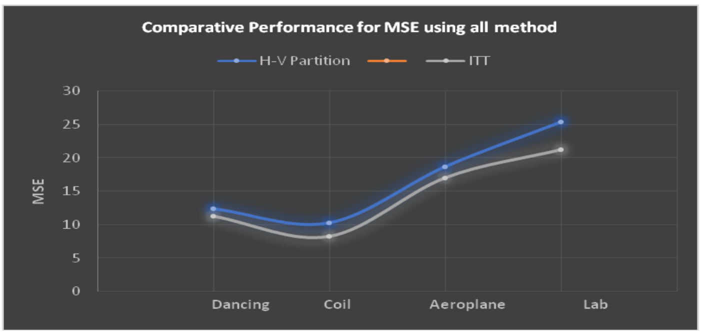

Figure 6: Shows the comparative performance of MSE (Mean Square Error) using H-V partition and ITT method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video.

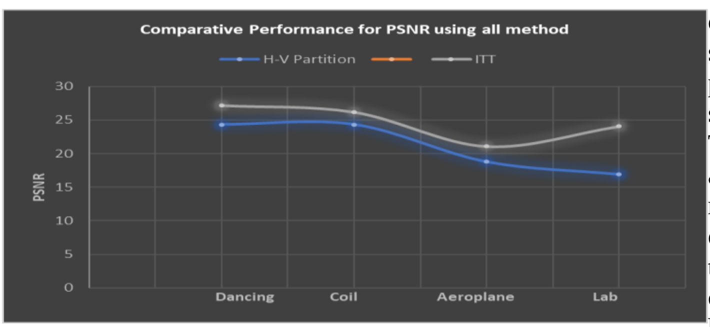

Figure 7: Shows the comparative performance of Encoding Time using H-V partition and ITT method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video.

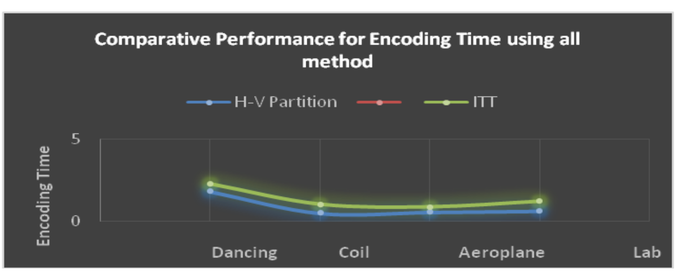

Figure 8: Shows the comparative performance of Encoding Time using H-V partition and ITT method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video.

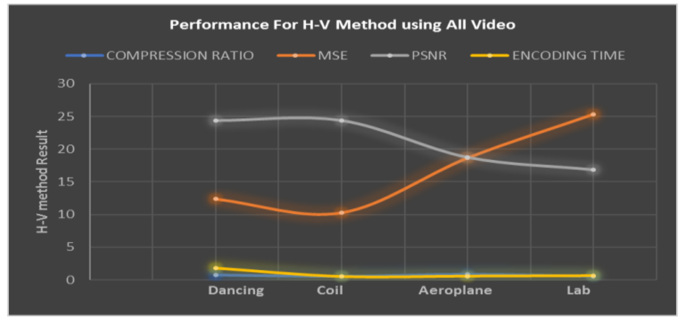

Figure 9: Shows the individual performance of Compression ratio, MSE, PSNR and Encoding time using H-V method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video.

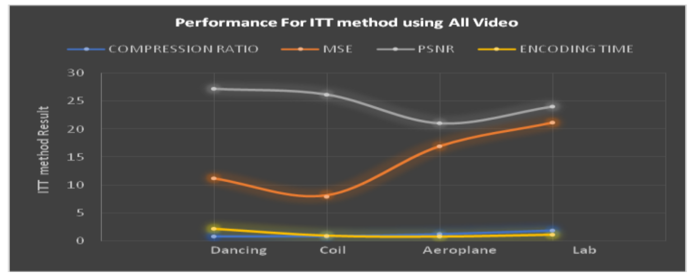

Figure 10: Shows the individual performance of Compression ratio, MSE, PSNR and Encoding time using ITT method for dancing.avi, coil.avi, aeroplane.avi and lab.avi video.

VI. Conclusion and Future Scope

This paper presented the video compression methods based on H-V partitioning technique with the mapping of particle swarm optimization. The particle swarm optimization provides the dual searching mode and reduces the multi-scales H-V partition relation of blocks and references blocks. This reduces space speedup the compression technique and also remains the quality of video. The mapping of PSO also reduces the redundant frames of video and reduces the value of MSE and increase the value of PSNR. Apart from all these there is major improvement in computational complexity. The search point is deduct by 30%-62% and hence the computational complexity. Moreover, the good subjective quality can be visualized in terms of quality of video. Thus, algorithm is giving good qualitative and subjective quality, high accuracy, high speed and less computational complexity output.

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Authors Profile

Shraddha Pandit is presently pursuing Ph.D. in Computer Science & Engineering from University Institute of Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal. She received B.E. in Computer Science & Engineering from Amravati University and M.E. in Computer Science & Engineering from Pune University, respectively. Her research interest include Image processing, Image Compression, Data Mining and Data Warehousing.

Dr. Piyush Kumar Shukla received his Bachelor's degree in Electronics & Communication Engineering, LNCT, Bhopal in 2001, M.Tech (Computer Science & Engineering) in 2005 from SATI, Vidisha and Ph.D. (Computer Science & Engineering) in 2013 from RGPV, Bhopal. M.P. India. He is a Member of ISTE (Life Member), IEEE, IACSIT, IAENG. Currently he is working as an Assistant Prof. in Department of Computer Science & Engineering, UIT-RGPV Bhopal. He is also I/C of PG Program (Dual Degree Integrated PG-Programs) in DoCSE, UIT, RGPV, Bhopal, Madhya Pradesh, Bhopal. He has published more than 40 Research Papers in various International & National Journals & Conferences, including 04 Papers in SCIE Journals & More than 10 papers in Scopus Journals.

Dr. Akhilesh Tiwari has received Ph.D. degree in Information Technology from Rajiv Gandhi Technological University, Bhopal, India. He is currently working as Associate Professor in the department of CSE & IT, Madhav Institute of Technology & Science (MITS), Gwalior, M.P. (India). His area of current research includes knowledge discovery in databases & data mining, Terrorist Network Mining and Business Intelligence. At present he is acting as a member of Board of Studies at MITS Gwalior, India. He has published more than 50 research papers in the Journals & Conferences of International repute. He is the Editor of Technia: International Journal of Computing Science & Communication Technologies. He is also acting as a reviewer & member in the editorial board of various international journals and program committee member/ member in the advisory board of various international conferences. He is in the panel of experts in various government bodies like UPSC, NIELIT etc. He has guided more than 20 dissertations at Master's level and presently supervising 04 research scholars at doctoral level. He is having the memberships of various Academic/ Scientific societies including IETE, GAMS, IACSIT, and IAENG.

