Algorithmic Approach on Video Compression

R. M. Joany*, E. Logashanmugam** and M. Ooha***

ABSTRACT

In video compression input is taken as video frames by applying the different algorithms and different techniques we increase the compression ratio and maintaining the resolution as per the applications required. Now a day's video compression has many applications like internet, medical, military and multi-media etc. Zero Wavelets Algorithm is applied on the frames and compresses the frames. Frames changes from RGB are converted into Grey and MSE (mean square error) is calculated and given as an input for the variable Block Matching Algorithm. Block matching is the most preferred motion estimation technique. The best block matching search is by binary motion vector technique. DWT decomposes the frames into sub-band coefficients, if it is below threshold takes as zero, otherwise it encodes. Compression ratio is increased and resolution is maintained. Simulation is done in Matlab R2013a.

Key words: Zero Wavelets Algorithm, Mean Square Error, Block Matching Algorithm, Motion Estimation, Binary motion vector technique.

1. INTRODUCTION

Video is sampled in two ways i.e., in progressive and interlaced form. In progressive a complete frame is sampled where as in interlaced method, half of the frame is sampled. Video is converted into frames and frames into pixels. Apply DWT or DCT on pixels to convert into frequency domain. It gives result in low frequency and high frequency. High frequency domain values are used for compression because human eye is sensitive to low frequency only.

Now-a-days video compression is mainly focusing on image quality rather than noise or error. In DWT compression is done through Temporal and Spatial resolution. Compression is achieved by reducing the sparsity and redundancy present in the video. They are two types of compression lossless and lossy compression. Lossless means no loss of information, lossy means some loss of information.

Different types of techniques are available for compression, Motion estimation, quantization, etc. These techniques are applied on different frames. Three types of frames I-frame, P-frame, B-frame. Intra coded frame is the reference without any loss of information and coded using Spatial Redundancy. Predictive frame predicts the past (p) and Bidirectional (b) frames predicts the past and future frame both are inter coded frame which exploits the Temporal Resolution.

The compression ratio (%) = Uncompressed Size/Compressed Size

Where,

Uncompressed is the original size of a video

Compressed is the compressed size of a video

$1 / ratio * 100 = X$

X% of the original video, subtract from 100 and have compression ratio in percentage.

*   Assistant Professor, Sathyabama University, Chennai, *Email: mariajoany@gmail.com*

**   E. Logashanmugam, Professor, Sathyabama University, Chennai, *Email: logu999@gmail.com*

*** M. Tech (VLSI), Sathyabama University, Chennai, *Email: oohamrg@gmail.com*

2.   BACK GROUND

The main objective is to minimize the storage space of a video. So, there are different algorithms and techniques that are helpful for compression of a video. Video coding schemes are used for low bit rate, where the clarity of the image is less, which is based on wavelets transform. The wavelets coefficients are coded by using SPIHT (set portioning in hierarchical tree). Motion estimation is done by using diamond search in block matching algorithm. It can even recognize the low bit rate of 0.1bps but with less motion content [1].

Video compression is done by using EZW (embedded zero wavelets) as an intra compression, where compression is done within a frame and requires less energy. Block matching algorithm finds motion vector by using different algorithms for searching the best matching block are exhaustive, three step search, new three step, simple and efficient, four step, diamond search, adaptive road pattern search. Disadvantage is the poor quality of the image, it's better to use SPIHT algorithm instead of EZW [2].

Video compression like DCT (discrete cosine transform), Quantization, Entropy coding and motion estimation. How much of data is to be compressed and which technique provide better result is Huffman technique and Huffman coding is used. By this techniques data size of the video storage is reduced and minimize the redundancy. It compresses the video without loss of any data at low cost [3]. Video compression algorithm uses the redundancy sources are temporal and spatial. Binary motion vector technique is used for block search and pruning DWT is used. It provides multiresolution due to DWT and it can't compress the data off low bit rate [4].

3.   PROPOSED WORK

Zero Wavelets Algorithm is applied on the video frames and compresses the frames and reduces the redundancy bits and the mean square error is calculated. At low bit rates i.e. compression ratios of the wavelets transform is very close to zero. Images tend to contain low frequency information and the high frequency is used for the quality of the image [5]. It keeps the threshold as a barrier takes the above and below values. By using zero wavelets algorithm enhancing the low bit rate and can compress the data. Output of the zero wavelets algorithms is given as an input for the block matching algorithm.

Two approaches are present in block matching,

1.   Pixel based approach(Optical flow method)

2.   Block based approach

Block based approach is of fixed size and variable block size. Variable block based approach is used. In pixel based approach, motion vector is calculated for every pixel, which is slow when compare to block based approach. Faster approach is the block-based motion estimation. In this method, the candidate frame is divided into no overlapping blocks and for each such candidate block, the best motion vector is determined in the reference frame by using SAD(sum of absolute difference).

The SAD is of minimum is taken as the best block matching [4]. Candidate block is in the current frame. Reference frame is compared with the current frame, by variable block search method. DWT decomposes the image into sub-bands like LL, LH, HH, and HL. If any redundancy is present it compress otherwise takes the another block. Below the threshold is taken as zero and above it encodes. This process repeats.

4.   FLOW GRAPH

The proposed scheme which follows these steps:
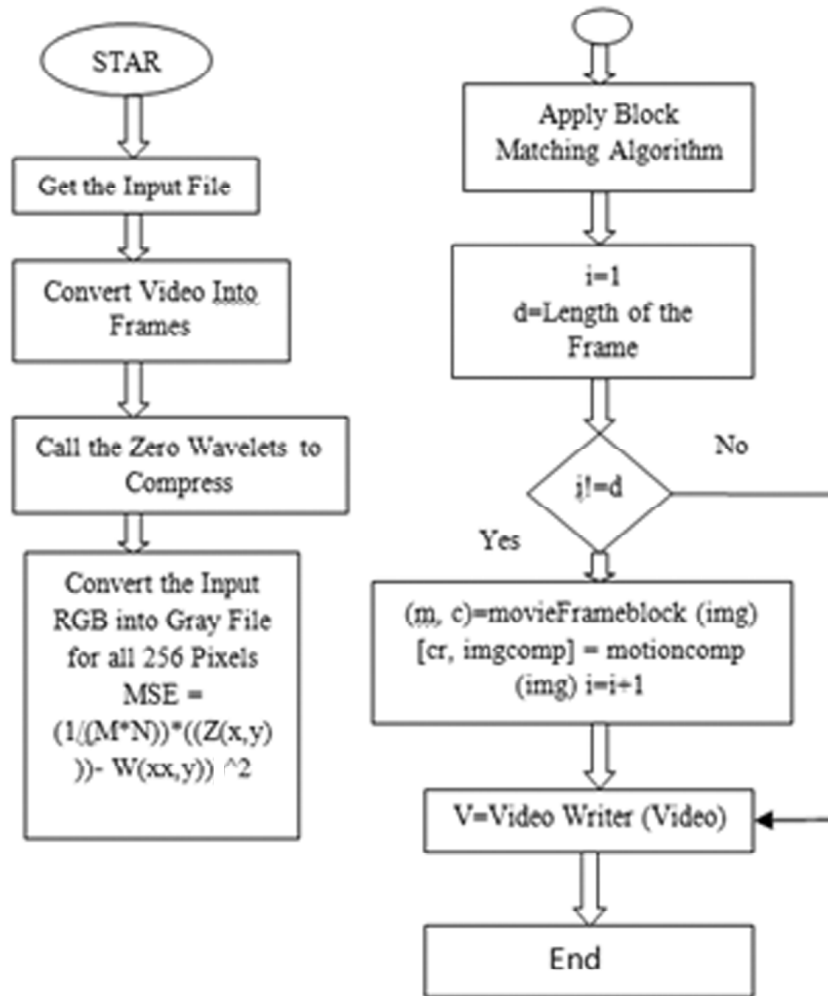
Flow Chart (Amend)

1. First video is converted into frames

2. Apply zero wavelets algorithm on the frames

3. Convert the RGB into grey scale and calculate the mean square error by using formula.

4. Output of the zero wavelets is the input of the block matching.

5. DWT decomposes the image into sub-bands and variable block based approach is used and compressed.

6. Reference variable "i" is taken and compared with the length of the frame

7. If not equal it resizes the image, otherwise it moves to the video

5. EXPERIMENTAL RESULT

Experiment result shows that proposed algorithm is applied on the various frames and achieves the better compression ratio when compared with the existing algorithms. Fig1 shows the original input of the still image having a resolution of 68.6 and the compression ratio of 82.6 and after applying the algorithms we get the compressed image having a resolution of 75.2 and the compression ratio increased to 98.3. Fig. 2 shows Zero Wavelets Algorithm compression ratio as 79.2. Fig. 3 shows the Block Matching Algorithm compression ratio as 88.06. Fig. 4 shows the combination of two algorithms compression ratio as 98.3.

**Figure 1: Comparison of the original
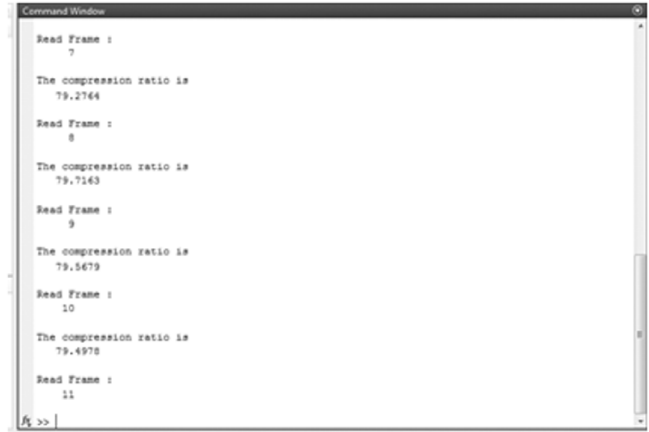and the reconstructed image**

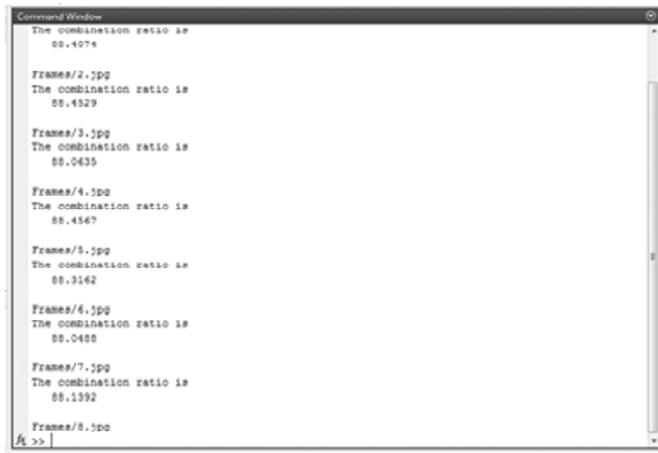**Figure 2: Zero wavelet algorithm
compression ratio**

**Figure 3: Block matching algorithm
compression ratio**

**Figure 4: Combination of two algorithms and compression ratio
increased for each frame**

Table 1

Sl No.	PSNR	Resolution	Compression Ratio
Original image	29.7	68.6	82.6
Compressed image	33.7	75.2	98.3

6.   CONCLUSION

In this paper zero wavelets algorithms is applied on the frames in which resolution is increased and with less compression ratio and variable block matching algorithm is applied on the same frame to increase the compression by using binary motion vector technique with DWT. Form the experiment result we can say that compression ratio is increased and the resolution is maintained.

REFERENCES

[1]   Sudhakar Radhakrishnan, Guruprasad Subbarayan and Karthick Vikram, "Wavelet Based Video Encoder Using KCDS" The International Arab Journal of Information Technology, Vol. 6, No. 3, July 2009.

[2]   Sangeeta Mishra, Sudhir Savarkar, "Video Compression Using EZW and FSBM" International Journal of Scientific and Research Publications, Volume 2, Issue 10, October 2012 1 ISSN 2250-3153.

[3]   M. Atheeshwari1, K. Mahesh 2, "Efficient And Robust Video Compression Using Huffman Coding", International Journal For Advance Research in Engineer and Technology, Volume 2, Issue VIII Aug. 2014 ISSN 2320-6802

[4] Ms. Megha S. Gaoture, Ms. Megha S. Gaoture, "Design and Implementation of Algorithm for Video Compression" ICICES 2014-S.A. Engineering College, Chennai, Tamil Nadu, India.

[5] Karthikeyan Thirunava, C.Thirumoorthi, "A Survey on Embedded Zero Tree Wavelet" Research Gate: ARTICLE. JANUARY 2014.

[6] Shruti Shettar, M.M. Raikar, "Video compression techniques: A survey" International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 14 Issue 2 –APRIL 2015.

[7] Zhengxin Hou1, Baochen Jiang1, 2, Yupeng Cao1, Aiping Yang1, and Chengyou Wang2, "Video Compression Based on Wavelet Transform and DBMA with Motion Compensation" Journal of Communications Vol. 8, No. 7, July 2013.

[8] Anustup Choudhury, Peter van Beek and Andrew Segall "Image Detail Enhancement Using A Dictionary Technique" IEEE Int. Conf. on Image Processing (ICIP 2012), Orlando, FL, USA, October 2012.

[9] Asadollah Shahbahrami, Ramin Bahrampour, Mobin S. Abbaghi Rostami, Mostafa Ayoubi Mobarhan, "Evaluation of Huffman and Arithmetic Algorithms for Multimedia Compression Standards" International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol. 1, No. 4, August 2011.

[10] Muzhir Shaban-Al-Ani and Talal Ali Hammouri, "Video Compression Algorithm Based on Frame Difference Approaches" International Journal on Soft Computing (IJSC) Vol. 2, No. 4, November 2011.

[11] Mamta Sharma, "Compression Using Huffman Coding" IJCSNS International Journal of Computer Science and Network Security, Vol.10, No.5, May 2010.

[12] Gaurav Gupta, Parul Thakur, "Image Compression Using Lossless Compression Techniques" International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 2 Issue: 12 3896–3900, | December 2014.