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EFFICIENT AND ROBUST VIDEO COMPRESSION USING HUFFMAN CODING

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Abstract *- The compression techniques for the images as well as the videos, increasing gradually in the past decade. Video compression techniques such as DCT coding, Quantization, Entropy coding, Motion estimation are widely used. The focus of this paper is to analyze video compression techniques required for video processing especially to discover how much amount of data to compressed, which techniques is faster and visual quality better and so on. We evaluate the video compression techniques for finding compression ratio. Handling video over the internet becomes very complex in the digital world. To reduce the complexity we need a strong algorithm to compress the video to reduce the size and do not affect visual quality. In this paper, we proposed Huffman coding to compress the video. Huffman's algorithm is very efficient to optimize the data, generating a minimum redundancy codes and provide the best compression compared with other methods.*
Keywords *- DCT coding, Quantization, Entropy coding, Motion estimation, Huffman Coding.*

1. INTRODUCTION

Basic techniques of video compression algorithms are efficient to reduce the redundancy of the video data. And producing a reconstructed video from the original video with the introduction of error that is insignificant to the intended applications. A digital video sequence can be represented as a series of JPEG pictures. The advantages are the same as with a single still JPEG pictures – flexibility both in terms of quality and compression ratio. There are two types of video Compression Algorithms: Lossless Compression Algorithms and Lossy compression algorithms. Lossless Compression, compresses the data with less amount of affect visual quality. Lossy compression compresses the data with more amount of affect visual quality. Here we propose a lossless compression technique like Huffman coding. The main objective of this paper is to compress videos by reducing the number of bits per pixel required to represent the videos using Huffman codes. We are implementing video compression in Huffman coding because various authors suggest the implementation complexity of Huffman coding less than with other algorithms. Huffman compression is based on growing a binary tree that contains A-Z characters in the source at its child nodes, and with their corresponding characters' probabilities at the side.

The video signal is an integral part of multimedia which has a tremendous importance in most of the applications involving the concept of the multimedia i.e. video conferencing; video-on-demand, broadcast digital video, and high-definition television (HDTV), etc [7]. Basically video compression in the domain of redundancy exists in a video sequence in two forms: spatial and temporal. Some popular video coding techniques in spatial domain like vector quantization, Block Transform, Discrete Cosine Transform and temporal domain like Frame Differencing, Motion Compensation, Block Matching. The video compression techniques include Frame Difference Approaches [1], Fuzzy concepts [2], PCA based method [3], CABAC Method [4], Accordion Function [5], EZW and FSBM [6],SPIHT Algorithms [7], Active Mesh Based [8],Wavelet Based Rate Scalable Method [9],Morphological operators [10].

The paper is structured as follows. Section 2 briefly discusses the background study for the proposed technique. Section 3 comprises of description about the proposed technique and the procedure for the proposed methodology. The experimental results and their evaluations also present in section 4. Section 5 gives the conclusion.

2. RELATED WORK

Yih-Chuan Lin and Shen-Chuan Tai et al have proposed a technique "Fast Full-Search Block-Matching Algorithm for Motion-Compensated Video Compression" in 1997. The proposed technique has been built upon fast block-matching algorithms that use three fast matching error measures, besides the conventional mean-absolute error (MAE) or mean-square error (MSE). An incoming reference block in the current frame is compared to candidate blocks within the search window using multiple matching criteria [18]

Eugeniy Belyaev et al. Propose a new spatial scalable and low complexity video compression algorithm based on multiplication free three dimensional discrete pseudo cosine transform. This paper/papered show an efficient result compared with H.264/SVC as well as it can be used for robust video transmission of wireless channels. [12].

Zhengxin Hou, Baochen Jiang, Yupeng Cao, Aiping Yang and Chengyou Wang et al. Proposed I frame encoding adopts wavelet transform and set partitioning in hierarchical trees (SPIHT) algorithm; of P frames, each frame sets the reconstructed frame of its previous frame as a reference frame, and then P frames proceed to code with ME and MC [14].

Lai-Man Po and Wing-Chung Ma et al.[17] have proposed "A Novel Four-Step Search Algorithm for Fast Block Motion Estimation" in 1995. The proposed algorithm has

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given based on the center-biased global minimum motion vector distribution characteristic of real world image sequences, a new Four-Step Search algorithm for fast block-based motion estimations.

Cong Dao Han et al. implemented a novel search algorithm which utilizes an adaptive hexagon and small diamond search to enhance search speed. Simulation results shown that the proposed approach can speed up the search process with little effect on distortion performance compared with other adaptive approaches [13].

F. Mueller et al. Proposed the work of introducing the generalized Gaussian distribution to model the DCT-coefficients more accurate than with Laplace distributions [16].

R. Reininger, J. Gibson et al. The distribution of DCT-coefficients in the field of image compression is examined and an approximation of the AC-coefficients with Laplace distributions is proposed [15].

3. PROPOSED METHODOLOGY

3.1 Summary of Techniques for Video Compression

The following table summary the video compression techniques, its areas of application and the, methodology of the techniques.

3.2 Huffman Coding

Huff man proposed to build compressed data by similar data is converted into same code. One of the main strengths of Huff man coding is it did not fix the code like ASCII. Huffman code is varying based on the input. In the computer science industry Huff man coding is one the big revolution for compression of data without any loss. Huff Man code generates Encoding table based on the input given the compression. So its Encoding table may be varied based on the input. And also encoding table is constructed based on the frequency of the data occurrence the ultimate aim of the Huffman coding is to use fewer numbers of bits frequently occurred data. Huffman code working procedure for text is. Read the input text. Get the ASCII value of each character. Suppose our input text is "Demo". Convert each character into the ASCII value so we get 68,101, 109,111. Three bits coding char code binary for "Demo" is

Table 1: Character into ASCII Conversion

D	0	00
E	1	01
M	2	10
O	3	11

Now the input text is encoded as 0123.

3.3 Video Compression using Huffman Coding

- **R**ead the video file.
- Extract the images (Frame) from Video file.
- Convert each image into a gray scale image
- Take Image Ij Order the all gray scale value in descending based on the repeated character count. Repeat this work for every image through N-1 image.
- Construct the heap tree with the help of descending order record.

Heap tree constructed based on the below rules.

- Left node must be lowest of sort's record.
- Second lowest is in right node.
- Build the Huffman code with the help of constructing the tree.
- Repeat the Step 5 to 7 until we get single node.
- Repeat all the step for each image

4. RESULTS AND DISCUSSION

The proposed compression and encryption mechanism is implemented with visual studio 2010 and language user c# .net framework 4.0 using windows 8- 64 bit operating system with core i5 processor and 4gb ram. The experiments are carried out on some standard videos.

The performance evaluation factors compression values are obtained from different video is summarized in Table 2.

Table 2: Compression Result for different videos

Video name	Original Size(kb)	Compressed Size (kb)
Barcodes	9891.84	888
Vipbarcode	59801.6	7065.6

Original and compressed of the two output results on barcodes and vipbarcode are shown in Figure 1 and 2 respectively.

Figure 1: Original Video

Figure 2: Compressed Video

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Table 3: Summarization of video compression Techniques

Summarization of Video Compression Techniques		
References	**Techniques**	**Methodology**
[1]	Frame Difference Approaches	Calculation of frame near distance (difference between frames) to compress videos.
[2]	Fuzzy concepts	H.264 is more effective than MPEG-4 of medical videos using new fuzzy based scheme.
[3]	PCA based method	Video is a composition of sequential and correlated frames, so we can apply the PCA to these high correlated frames. Compared with DCT doesn't reduce the bandwidth of frequency response, so the Edges of frames don't fade.
[4]	CABAC Method	Combining an adaptive binary arithmetic coding technique with context modeling, a high degree of adaptation and redundancy reduction is achieved on the new ITU-T/ISO/IEC standard H.264/AVC for video compression is presented.
[5]	Accordion Function	In this proposed method input video to reduce the spectral And temporal redundancies using accordion function. it converts the temporal redundancy into the spatial redundancy, which was removed using Discrete Cosine Transform (DCT)
[6]	EZW and FSBM	Video compression is done using EZW as intra compression and seven different algorithms of the block matching algorithms used for motion estimation in video compression. The results are much better if instead of EZW, SPIHT algorithm is used.
[7]	SPIHT Algorithms	Traditional approach as well as proposed one i.e. SPIHT (Set Partitioning in Hierarchical Trees) algorithm for video Compression of the signal. SPIHT algorithm also provides better video compression without effecting image quality.
[8]	Active Mesh Based Motion Compensation Algorithm	New mesh based algorithm proposed for motion estimation and compensation in the wavelet domain. It is based on the mesh energy minimization with novel sets of energy functions. In this algorithm proposed two main approaches 1, motion estimation of consecutive frames 2, motion estimation and compensation in the wavelet sub-bands compensation in the wavelet sub-bands.

Figure 3: Original Video

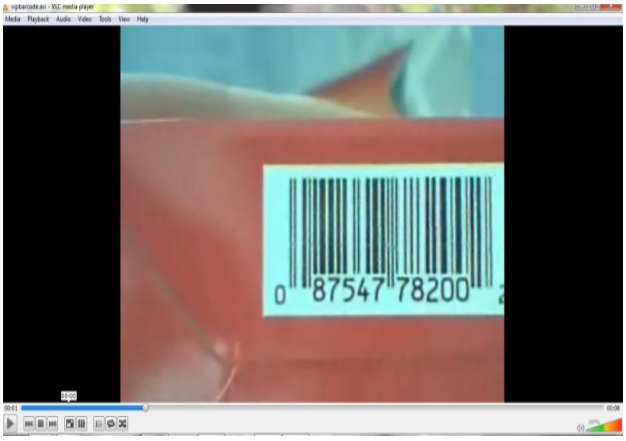

Figure 4: Compressed Video

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5. CONCLUSION

Our Proposed method works very efficiently and compresses the video without loss of data using Huffman encoding technique. Compare to other compression technology Huffman coding is more efficient and also it uses minimum resource to compress the video at low cost. In video compression technique Huff Man Based on the results obtained, the proposed method Huffman encoding will give better performance.

References

[1] 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.

[2] J. Mohanalin Rajarathnam, A novel Fuzzy based Medical video compression using H.264, Georgian Electronic Scientific Journal: Computer Science and Telecommunications 2008, No.3(17).

[3] Mostafa Mofarreh-Bonab, Mohamad Mofarreh-Bonab, Adaptive Video Compression using PCA Method International Journal of Computer Applications (0975 – 8887)Volume 44– No.21, April 2012.

[4] Detlev Marpe, Heiko Schwarz and Tomas Wiegand, "Context-Based Adaptive Binary Arithmetic Coding in the H.264/AVC Video Compression Standard", in IEEE Transactions on Circuits and Systems for Video Technology. Vol 13, No.7 July 2003.

[5] Mitesh Shah, Hetal Patel, "Design of a New Video Compression Algorithm Using Accordion Function ", International Journal of Science and Modern Engineering (IJISME) ISSN: 2319-6386, Volume-1, Issue-6, May 2013.

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

[7] Charu Pandey, Satish Kumar, Rajinder Tiwari, "An Innovative Approach towards the Video Compression Methodology of the H.264 Codec: Using SPIHT Algorithms ", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-5, November 2012.

[8] Mohammad Hossein Bisjerdi, Alireza Behrad, "Video Compression USING a New Active Mesh Based Motion Compensation Algorithm in Wavelet Sub-Bands", Journal of Signal and Information Processing, 2012, 3, 368-376.

[9] Ke Shen,Edward J. Delp , " Wavelet Based Rate Scalable Video Compression", IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 9, NO. 1, FEBRUARY 1999.

[10] Philippe Salembier, Patrick Brigger, Josep R. Casas and Montse Pardas, "Morphological Operators for Image and Video Compression", IEEE TRANSACTIONS ON IMAGE PROCESSING VOL. 5 NO. 6, JUNE 1996.

[11] Eugeniy Belyaev et al., "Scalable Video Coding Based on Three Dimensional Discrete Pseudo Cosine Transform", ruSMART/NEW2AN 2010, LNCS 6294, pp 448-459, 2010.

[12] Cong Dao Han et al., "An Adaptive Fast Search Algorithm for Block Motion Estimation in H.264", Journal of Zhejiang University Science C (Computer & Electron), Vol. 11, No. 8, pp 637-644, 2010.

[13] Zhengxin Hou, Baochen Jiang, Yupeng Cao, Aiping Yang and Chengyou Wang, "Video Compression Based on Wavelet Transform and DBMA with Motion Compensation", Journal of Communications Vol. 8, No. 7, July 2013.

[14] R. Reininger, J. Gibson, Distributions of the Two Dimensional DCT Coefficients for Images, IEEE Transactions on Commun. Vol. COM-31, pp. 835–839, June, 1983

[15] F. Mueller, Distribution Shape of Two-Dimensional DCT Coefficients of Natural Images, Electronic Letters Vol. 29, No. 22, pp. 1935–1936, October 28, 1993.

[16] Lai-Man Po and Wing-Chung Ma, A Novel Four-Step Search Algorithm for Fast Block Motion Estimation IEEE Trans. CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 6, NO. 3, JUNE 1996.

[17] Yih-Chuan Lin and Shen-Chuan Tai, Fast Full-Search Block-Matching Algorithm for Motion-Compensated Video Compression IEEE Trans. COMMUNICATIONS, VOL. 45, NO. 5, MAY 1997.