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A Comparative Study of Video Compression Techniques

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ABSTRACT

In modern world more image and video compression technologies improving gradually. But major barrier of the new technologies concepts are repeated from authors. Because authors can't find in depth of the papers from various technologies. So Survey of Video Compression Techniques very helpful for these types problems in video compression areas. Video compression techniques such as DCT coding, Quantization, Entropy coding, Motion estimation are widely used in video compression techniques. The main focus of this paper is to analyse 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 in terms of performance, speed and accuracy. We also compare video compression techniques with conventional methods.

Keywords: DCT coding, Quantization, Entropy coding, Motion estimation

I. INTRODUCTION

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. This paper provides the summary of all these techniques in terms of the problem they solve or their methodology in video compression techniques or the tools which are implemented over them and so on. 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]. Performance metrics used are Peak Signal to Noise Ratio (PSNR) and Compression Ratio (CR).

II. METHODS AND MATERIAL

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; for 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]. EugeniyBelyaev et al. Proposed a new spatial scalable and low complexity video compression algorithm based on multiplication free three dimensional discrete pseudo cosine transform. This paper shows an efficient results compared with H.264/SVC as well as it can be used for robust video transmission over wireless channels [12].

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].

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 given based on the center-biased global minimum motion vector distribution characteristic of real world image sequence, a new Four-Step Search algorithm for fast block-based motion estimation. F. Mueller et al. proposed the work of introduces the generalized Gaussian distribution to model the DCT-coefficients more accurate than with Laplace distributions [16].

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 showed that the proposed approach can speed up the search process with little effect on distortion performance compared with other adaptive approaches [13].

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 a fast block-matching algorithm that uses 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]

DWT BASED IMAGE COMPRESSION TECHNIQUES

Prasanthi Jasmine et al (2012) proposed wavelet and ridgelet based compression methods. Methodology involved is: the RGB image is converted to gray scale and is de-noised with Gaussian filter; Discrete Wavelet Transform (DWT) is performed on the de-noised image; Finite Ridgelet Transform (FRT) is employed to obtained wavelet coefficients; compressed image of reduced size is obtained; decompression is done by applying Inverse FRT and DWT and the original image is obtained without loss of data. This hybrid image compression technique results in compression of the image in an effective manner without losing data.

HYBRID IMAGE COMPRESSION TECHNIQUES USING DCT AND DWT

Bharath et al (2013) proposed a hybrid compression technique using DWT, DCT and Huffman techniques to reduce the blocking artifacts and also false contouring that occurs during DCT technique. The steps involved are as follows: the source 256x256 image is divided by splicing into 32x32; 1D – DWT is implemented on the image and is divided into 16x16 blocks; 2D-DWT is implemented on the image and is divided into 8x8 blocks; 2D-DCT technique is applied on the 8x8 image block and is quantized; Huffman coding is performed for better compression. The proposed algorithm has decreased the contouring effects (DCT) in the reconstructed image. Nikita Bansal and Sanjay Kumar Dubey (2013) illustrated a hybrid image compression transform technique. The main aim is to have high compression ratio by maintaining good quality and also to reconstruct the image with less computation resources. The steps involved are: Input image 256 x 256 is divided into 32x 32 using DCT technique; 1st level of 2D-DWT is performed on the 32x32 image to obtain 16x16 blocks; by implementing the 2nd level of 2D-DWT the image is divided into 4x4; scaling is done and at the receiver’s end rescaling and inverse of DWT and DCT technique is applied. DCT technique performs effectively at medium rates; using DWT technique produces blurring image at boundaries. By combining the advantages of both techniques, higher compression ratio is achieved.

III. RESULTS AND DISCUSSION

SUMMARY OF TECHNIQUES FOR VIDEO COMPRESSION

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.
[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
[8]	**Active Mesh Based Motion Compensation Algorithm**	New mesh based algorithm proposed for motion estimation and compensation in the wavelet domain
[9]	**Wavelet Based Rate Scalable Method**	It provides new novelty algorithm for a hybrid video compression algorithm. In this algorithm achieved effective compression in videos for the following steps. First, an adaptive motion compensation scheme is used. Second, a spatial orientation tree modified zero tree algorithms that use not only the frequency bands, but also the color channels to scan the wavelet coefficients.
[10]	**Morphological operators**	In this paper proposed video compression using some morphological tools. Mathematical morphology can be considered as a shape oriented approach to signal processing and Some of its features make it very useful for compression for videos.

IV. CONCLUSION

In this paper we survey various video compression techniques that have been employed. We have seen that all the schemes discussed above Frame Difference Approaches, Fuzzy concepts, PCA based method, CABAC Method, Accordion Function, EZW and FSBM,SPIHT Algorithms, Active Mesh Based, Wavelet Based Rate Scalable Method and Morphological operators. From the review of various video compression papers it infers that there are still lots of possibilities for the improvement of video compression technique. This survey paper very helpful for find the video compression in current trends and next level of problem identification.

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