A Survey: Various Techniques of Video Compression

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***Abstract*— Video compression techniques to solve reducing and removing redundant video data so that a digital video file can be effectively sent and received over a network and stored on computer disks. Now day's lot of video compression techniques proposed. With efficient compression techniques, a significant reduction in file size can be achieved with little or no adverse effect on the visual quality. The Video Compression algorithm utilized in numerous standards (such as MPEG 1, 2 H.263) usually consists of the following steps. Motion Estimation, Motion Compensation, Discrete Cosine Transform, Run Length Encoding, Huffman Coding. Frame Difference, PCA Method. Many papers and researches are published related to these subject and some of these are taken. This paper gives the survey about some techniques reviewed and discussed from different authors. So it is very helpful to analyzed and compared with any proposed works for video compression techniques.**

***Keywords*— Motion Estimation, Motion Compensation, Discrete Cosine Transform, Run Length Encoding, Huffman Coding. Frame Difference, PCA Method., video compression.**

I. INTRODUCTION

Video compression is an essential enabler for these applications and an increasing number of video codec (compression/decompression) industry standards and proprietary algorithms are available to make it practical to store and transmit video in digital form. Compression standards are evolving to make use of advances in algorithms and take advantage of continued increases in available processing horsepower in low-cost integrated circuits such as digital media processors. Differences exist in the compression standards and within implementation of standards based on optimizations for the primary requirements of the target application. Generally speaking, video compression is a technology for transforming video signals that aims to retain original quality under a number of constraints, e.g. storage constraint, time delay constraint or computation power constraint. It takes advantage of data redundancy between successive frames to reduce the storage requirement by applying computational resources. The design of data compression systems normally involves a tradeoff between quality, speed, resource utilization and power consumption. Conceptually Video Compression algorithm utilized in numerous standards (such as MPEG 1, 2 H.263) usually consists of the following steps. Motion Estimation, Motion Compensation, Discrete Cosine Transform, Run Length Encoding, Huffman Coding. Frame Difference, PCA Method.

II. MOTION ESTIMATION

DEF:

The motion estimation process is done by the coder to find the motion vector pointing to the best prophecy macro block in a reference frame or field. The motion estimation process explained before or after frames to identify blocks that have not changed, and motion vectors are stored in place of blocks.[6] The process of video compression using motion estimation is also known as interframe coding.

Related Article:

Lai-Man Po and Wing-Chung Ma *et al.*[4] 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. Experimental results show that the proposed Four-Step Search algorithm performs better than the well-known 3SS and have similar performance to the N3SS in terms of mean-square error measure with smaller computational requirement. In addition, Four-Step Search is more robust as compared with 3SS and N3SS. It is because the performance of Four-Step Search is maintained for image sequence that contains complex movement such as camera zooming and fast motion. On the other hand, the Four-Step Search also possesses the regularity and simplicity of hardware-oriented features.

III. MOTION COMPENSATION

DEF:

Motion compensation is an algorithmic technique employed in the encoding of video data for video compression, for example in the generation ofMPEG-2 files. Motion compensation describes a picture in terms of the transformation of a reference picture to the current picture. The reference picture may be previous in time or even from the future. When images can be accurately

synthesized from previously transmitted/stored images, the compression efficiency can be improved. Motion compensation exploits the fact that, often, for many frames of a movie, the only difference between one frame and another is the result of either the camera moving or an object in the frame moving. In reference to a video file, this means much of the information that represents one frame will be the same as the information used in the next frame.

Related Article:

Yih-Chuan Lin and Shen-Chuan Tai *et al.*[5] 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. These three fast matching error measures are established on the integral projections, having the advantages of being good block features and having simple complexity in measuring matching errors. Most of the candidate blocks can be rejected only by calculating one or more of the three fast matching error measures. The time-consuming computations of MSE or MAE are performed on only a few candidate blocks that first pass all three fast matching criteria. The proposed technique has given simulation results show that a reduction of over 86% in computations is achieved after integrating the three fast matching criteria into the full-search algorithm, while ensuring optimal accuracy.

IV. FRAME DIFFERENCE METHOD

DEF:

In the field of video compression a video frame is compressed using different algorithms with different advantages and disadvantages, centered mainly on amount of data compression. These different algorithms for video frames are called picture types or frame types. The three major picture types used in the different video algorithms are I, P and B. They are different in the following characteristics:

1. I-frames are the least compressible but don't require other video frames to decode.
2. P-frames can use data from previous frames to decompress and are more compressible than I-frames.
3. B-frames can use both previous and forward frames for data reference to get the highest amount of data compression.

Related Article:

MuzhirShaban Al-Ani and Talal Ali Hammouri et al. [7] has proposed a "Video Compression Algorithm Based on Frame Difference Approaches" in 2011. The proposed design is implemented Wavelet transform is an efficient method that can be used to perform an efficient compression technique. This work deals with the developing of an efficient video compression approach based on frames difference approaches that concentrated on the calculation of frame near distance (difference between frames). The selection of the meaningful frame depends on many factors such as compression performance, frame details, frame size and near distance between frames. The implemented system passes into many steps; pre-processing, frame extraction, frame selection, frame reordering, 2D DWT, then video construction. Different types of videos are introduced to test the system. The output compressed video is in a good quality and good performance as well as it has a specific compression ratio.

V. CONCLUSIONS

In this paper, it has been surveyed that the existing works on the video compression techniques. Also we have tried to analyze the different video compression techniques for effective and useful video compression. Currently, many new schemes are proposed in the field of video compression. We have seen that all the schemes discussed above, four-step search algorithm for fast block motion estimation widely used video compression techniques. Also compared with other methods fuzzy techniques are rarely used in the video compression. Already video segmentation techniques applied in fuzzy k-means and c-means are used. So we are proposed video compression in fuzzy k-means algorithm. This survey paper very helpful for find the video compression in current trends and next level of problem identification.

REFERENCES

[1] Rajeshwar Dass , Lalit Singh, Sandeep Kaushik , *Video Compression Technique* INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 1, ISSUE 10, NOVEMBE 2012.

[2] Aman Gupta, Dinesh Goyal, Naveen Hemrajani, *Performance Analysis of Various Video Compression Techniques* International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064.

[3] S. Immanuel Alex Pandian,Dr.G. Josemin Bala,Becky Alma George, *A Study on Block Matching Algorithms for Motion Estimation*, International Journal on Computer Science and Engineering (IJCSE)

[4] 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.R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.

[5] 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.

[6] Shih-Fu Chang and David G. Messerschmitt, *Manipulation and Compositing of MC-DCT Compressed Video* publication in IEEE JSAC Special Issue on Intelligent Signal Processing, 1994.

[7] MuzhirShaban 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.