A Lossless Video Compression using DCT

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Abstract— Even though wavelet-based video compression has been an area of research for more than a decade, motion estimation and compensation has been considered complex and in efficient until recently. We have carried out a thorough investigation of existing research work in this field, and found that fundamental problem with wavelet-based temporal removal while obtaining highly scalability (the wavelet-properties of multi solution structure in combination with embedded coding), has been solved by performing motion compensated temporal filtering within the wavelet domain of a over complete three-dimensional lifting-based wavelet transform, and that wavelet-based video CODEC snow can compete with DCT-based video CODERS. In addition we have designed and implemented a video compression prototype founded on the Java Media Framework API and a DCT- and DWT-based still-image compression application developed by four engineer students in a previous project. We carefully planned a stepwise implementation progress, to help us making the prototype extendable.

Keywords: Matlab Software

I. INTRODUCTION

Video is an effective manner of entertainment and communication, now a day. But it needs a vast storage and transmission bandwidth. For example, A video of 90 minutes, frame rate of 30 frames per second and 750*570 resolution, it will needs 2.78 GB storage. The storage and bandwidth need for this uncompressed video is very high, compressed size of such video is upto a certain MB's, then requirement of storage can be reduced to a large size. Video compression provides the way to compress the video's size. The videos and images contain a big amount of redundant information. The main procedure in the video compression is about rejecting this redundant information, which is unobservable for the human eyes.

In the procedure of video compression, algorithm is put onto the input uncompressed video to generate the output compressed video, which can be efficient for transmission or storage. Video compression decreases the file size, so that compressed video needs an realistic amount of download time. Following are the two types of compression methods are:

A. Lossy Compression:

The investigation of the study in digital video compression is conquered by lossy compression, where in order to get the best possible compression efficiency; it considers certain level of distortion.

B. Lossless Compression:

The lossless compression technique is generally focused on the decreasing the compressed output video' bit rate without any alteration of the frame. The decompressed bit-stream is matching to the original bit-stream.

1) Video Compression:

The main unit behind the video compression approach is the video encoder found at the transmitter side, which encodes the video that is to be transmitted in form of bits and also the video decoder positioned at the receiver side, which rebuild the video in its original form based on the bit sequence given at the encoder. Video compression reduces redundancy and irrelevancy.

2) Need of Compression:

Now a day every mobile comes with HD cameras. Even if you take 5 min video, your video file size will be around 200 MB or more. When you want to send this file through facebook or what's app, it will not accept or it will take too much time and bandwidth. It must to reduce video file size. High bit rates that result from the various types of digital video make their transmission through their intended channels very difficult. Even entertainment video with modest frame rates and dimensions would require bandwidth and storage space far in excess of that available from CD-ROM. Thus delivering consumes quality video on compact disk. Even if high bandwidth technology(example, fiber optic cable) was in place, the per byte cost of transmission would have to be very low before it would be feasible to use it for the staggering amount of data require by HDTV. Finally, even if the storage and transportation problems of digital video were overcome, the processing power needed to manage such volumes of data would make the receiver hardware very expensive. Although significant gain in storage, transmission and processor technology have been achieved in recent years, it is primarily the reduction of amount of data that needs to be stored, transmitted and processed that has made wide spread use of digital video a possibility. This reduction of bandwidth has been made possible by advance in compression technology.

Sources of Redundancy:

1) Spatial
2) Temporal

II. PROBLEM STATEMENT

A. Lossy Compression

Lossy compression means that the compressed file has less data in it than the original file. Images and sounds that repeat throughout the video might be removed to effectively cut out parts of the video that are seen as unneeded. In some cases, this translates to lower quality files because information has been "lost," hence the name. However, you can lose a relatively large amount of data before you start to notice a difference (think MP3 audio files, which use lossy compression, too). Lossy compression makes up for the loss in quality by producing comparatively small files. For example, DVDs are compressed using the MPEG-2 format, which can make files 15 to 30 times smaller, but viewers still tend to perceive DVDs as having high-quality pictures. Most

video files uploaded to the internet uses lossy compression to keep the file size small while delivering a relatively high-quality product. If a video were to remain at its (in some cases) extremely high file size, not only would it take forever to upload the content online, but users who have slow internet connections would have an awful time streaming the video or downloading it to their computer.

III. PROPOSED SYSTEM

The objective of video compression technique is to reduce idleness of the image pixel data for the purpose of storage or transmission of data in an efficient form, This results in the reduction of file size and allows more images to be stored in a given amount of disk or memory space.

Fig.1 shows the block diagram of the proposed work. As shown in the figure the real time video have been recorded. The threshold number is provided for video capturing. The frames get captured till the threshold number and camera stops the recording. This process has been done in the MATLAB. Image frames are extracted from the recorded video and preprocessing is applied on it. For any processing to be applying on the image, preprocessing of the image is importantly required. It simplifies the complexities that have been occurred with the colored image. The aim of pre-processing is an improvement of the data images that suppresses redundant distortions or enhances some image features that are required for further processing. Header file of every extracted image frame is done, in which all row's and all column's pixel values are stored, which is required in the main compression part

IV. BLOCK DIAGRAM AND DESCRIPTION

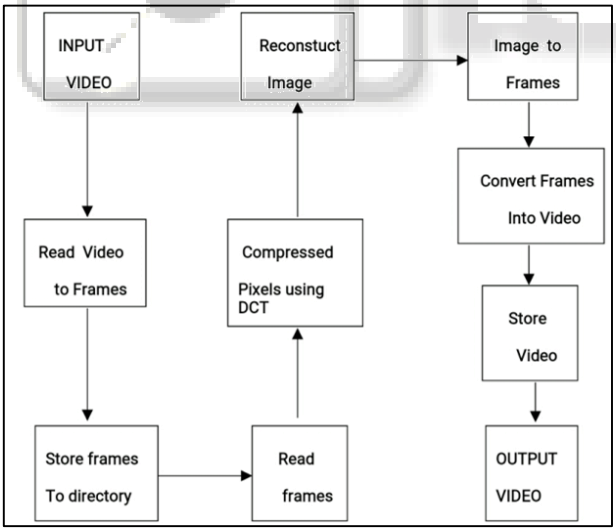


Fig. 1: Block Diagram of Video Compression

A. Description

Figure 1 explains about the video compression using the DCT technique. The process of this video compression using the DCT is as follows. First we will convert the input video into the frames by using the some MATLAB coding. These frames will be stored in the directory then these frames will be read and these pixels of the frames will be adjusted and compressed by using DCT then the images will be reconstructed. These images will be converted into frames and then frames to video. At last the obtained output video will be saved.

The method proposed in was based on the algorithm called Discrete Cosine Transform. In this transform we are going to find a quantization parameter (QP) matrix for each and every video frame. So that the difference between the saliency map of the coded frame and the saliency map of original raw frame was minimized under a given target bit rate.

STEPS:

1) Video to frames and noise elimination
2) Frame resolution adjustment
3) Image compression module
4) Output frame assembling as video

1) Video to Frames and Noise Elimination:

At first we convert the video to frames by taking .avi video as input and any number of frames per seconds like (20 FPS).FPS means for one second video 20 frames will be the output. Normally 24 frames will gives the perfect video quality. While compression we can take any number of frames per second but if we increase the number of frames then the frame recombination and alignment will be difficult. We propose to write the code in such a way that we can get output frames in any format like .jpg, .png, .tiff etc…. The image frames will be saved serially like 1.jpg, 2.jpg, 3.jpg, 4.jpg.

2) Frame Resolution Adjustment:

The resolution of frames will be adjusted to maintain the quality or pixel distortions but without increasing the size of the image. This can be achieved by taking care of the Region of Interest (ROI) parts alone in the image and concentrating less on the non ROI parts. Thereby we can be able to achieve the good video quality without increasing the size of the video. Hence the output video will be having good quality.

3) Image Compression Module:

At first we will convert the video to frames this can be done by using the software called MATLAB. These obtained frames will be saved as images then the image compression is done using the Discrete Cosine Transform. Because this technique is most prominent, less time consuming and gives more compression ratio. The same compression will be repeated for all the frames obtained from the video.

4) Output Frame Assembling as Video:

This is another crucial process in the compression process. The compressed frames will be reassembled in the same order how we converted the video into the frames. The output video will be tested for the size.

Video compression system using DCT algorithm To compress the video, initially the video needs to be converted into individual frames and then compression techniques are applied on each frame. To compress the picture, DCT applies to each frame and thus, type of the DCT method is an intra-frame compression.

Once, compression of all the frames are done, the sequence of compressed frame forms the compressed video, whose size is relatively smaller than original video.

Basically in the DCT method, the compression occurs in a three step process. Firstly, each frame is divided into small blocks and then DCT is applied on each frame, after applying DCT on each frame, it converts the entire pixel values into frequency domain such that the larger frequency

pixels reside into the bottom-right and the smaller frequency pixels reside into the top-left places in the matrix. As the eye of human is sensible only to lower frequency pixels and thus, the higher frequency pixels are rejected. Secondly, the quantization is applied onto the obtained matrix such that, the coefficients reject their values after the decimal point. Depending on this, the scaling factor is choose, so that even after the values later than the decimal point are rejected, the value remains almost the similar. Then, finally the coding technique for compression is applied, after that because of applying the Inverse DCT, the original file can be reconstructed. The algorithm used in these technique takes any number of jpeg video frames and the any size video can be compressed. The DCT algorithm is simplest and balanced, so that, it is quite easy to be implemented when compared to the other compression techniques.

B. DCT [Discrete Cosine Transformation]:

DCT separates images into parts of different frequencies where less important frequencies are discarded through quantization and important frequencies are used to retrieve the image during decompression. Compared to other input dependent transforms, DCT has many advantages:

1) It has been implemented in single integrated circuit.
2) It has the ability to pack most information in fewest coefficients.
3) It minimizes the block like appearance called blocking artifact that results when boundaries between sub-images become visible.

V. ALGORITHM

1) Give Video as a Input.
2) Read Video and convert into frames.
3) Save these frames into directory
4) Compressed these frames using DCT.
5) Reconstruct images to frames.
6) Covert these frames into video.
7) Take compressed video as a Output.

VI. APPLICATIONS

A. Telemedicine:

Medical images such as X-rays, CT-scan requires every finer detail of the object without loosing any important data in such place lossless video compression can give fruitful results.

B. High Quality Multimedia Systems:

In such systems reducing storage capacity is the major task. In such systems the movie or video is reduced with loss of any important details.

C. Video Conferencing:

In applications in which we have to transmit large data with small bandwidth we can use these schemes. This scheme reduces the data to be transmitted. We can use this scheme in more applications such as in DVD players and Digital Television set-top boxes.

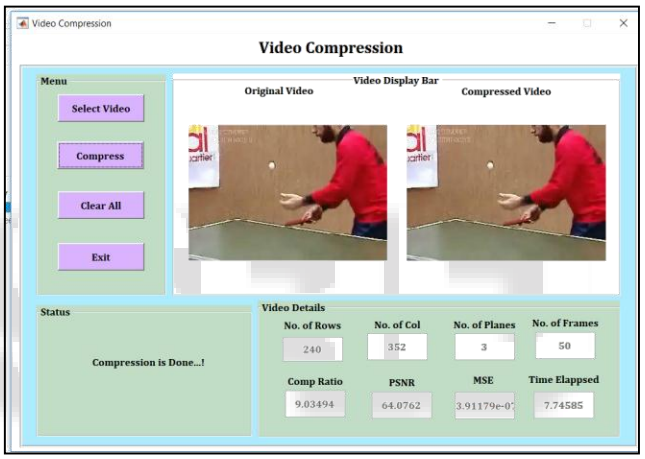
D. Video Processing.

As video consist of 25 frames per second which is given as input with high speed so increases the performance of all that frame using deblurring.

VII. RESULT

A. Convert Video to Frames

B. Final Result



VIII. CONCLUSION

The discrete wavelet transform (DWT) gives a multi-resolution presentation of images. This work highlights on the simple and fast Haar implementation of DWT and IDWT algorithms using system c coding.

The algebraic equations of DWT algorithm are used to reduce the complexity and boost the computational speed. 2D DWT is performed on images of different pixel size. First, the preprocessing part of the images extracted from captured video is performed by using MATLAB tool. The code is written in system c language and implemented on FPGA.

The compressed video frames again decompressed and converted into video using MATLAB. System parameter such as pick signal to noise ratio is measured. From the adequate simulation results we can conclude that algorithm works properly.

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