Efficient video compression for Web Based applications

[1]Shreya Sankhe, [2]Poorva Waingankar, [3]Namrata kulkarni
[1]P.G Student, [2]Associate Professor, [3]Assistant professor
[1]Shree L.R.Tiwari college of engineering, [2]Thakur college of engineering & technology, [3]Shree L.R.Tiwari college of engineering

Abstract - Over the decade there have been significant advances in Compression technologies. It is desirable to achieve faster data transfer and better compression ratio without compromising video quality. For efficient video compression, optimizing coding efficiency is important factor. Coding efficiency is nothing but the ability to minimize the bit rate necessary for representation of video content to reach a given level of video quality—or, as alternatively formulated, to maximize the video quality achievable within a given available bit rate[1][2]. In this paper, comparative analysis of different video compression algorithms will be carried out. The efficient one will be chosen for further application. All algorithms will be implemented in matlab. The parameters which will be compared are PSNR, MSE & Compression ratio.
Objective - Need for video compression (demands, requirements) the objective of this project is to achieve a higher Video compression ratio & acceptable PSNR (>35 dB).

Keywords - Video Compression; PSNR;MSE;Compression Ratio; Frame skipping algorithm; Discrete cosine Transform based Algorithm; Motion vector for video compression

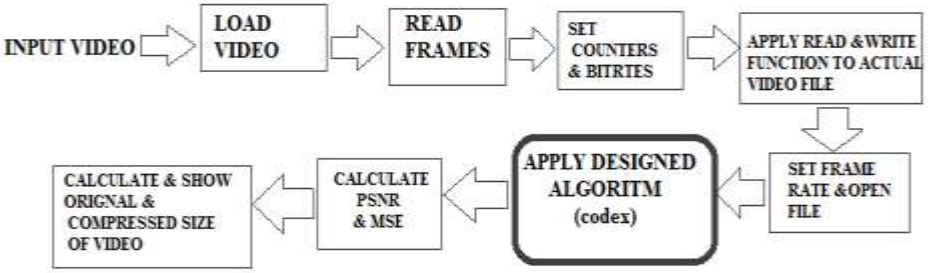
I. INTRODUCTION

An analog video signal typically occupies a bandwidth of a few megahertz. However, when it is converted into digital form, at an equivalent quality, the digital version typically has a bit rated well over 100 Mbps. This bit rate is too high for most networks or processors to handle. Therefore, the digital video information has to be compressed before it can be stored or transmitted. Multimedia files are large and consume lots of hard disk space, video file size makes it time-consuming to transmit& receive over wireless or wired networks.so the current scenario demands optimum utilization of channel bandwidth by compressing multimedia data using efficiently designed codex.
To overcome the problem stated above & in respect to achieve solution, there is need to study existing algorithms, compare their performance for various applications and propose modification.

II. THEORY

On the background of the problem statement defined, propose to resolve the bandwidth & memory space requirement using modified algorithms. Traditional video compression algorithms are based on eliminating redundancies at inter frame & intra frame level, maintain good quality of video. The proposed model will be based on more efficient redundancies removal by which further compression can be achieved. The optimized solution for particular application (mobile, internet conferring, live streaming etc.) will be suggested.

The basic video compression system comprises of the video encoder at the transmitter side, which encodes the Video to be transmitted in terms of bits and the video decoder at the receiver side, which reconstructs the video in its Original form from the bit sequence received. Video consist number of frames. First of all the video is converted into the sequence of frames which are nothing but like still images sequence. then apply design algorithm or compression technique to the frames; calculate the PSNR ; MSE values and compressed video size of it.



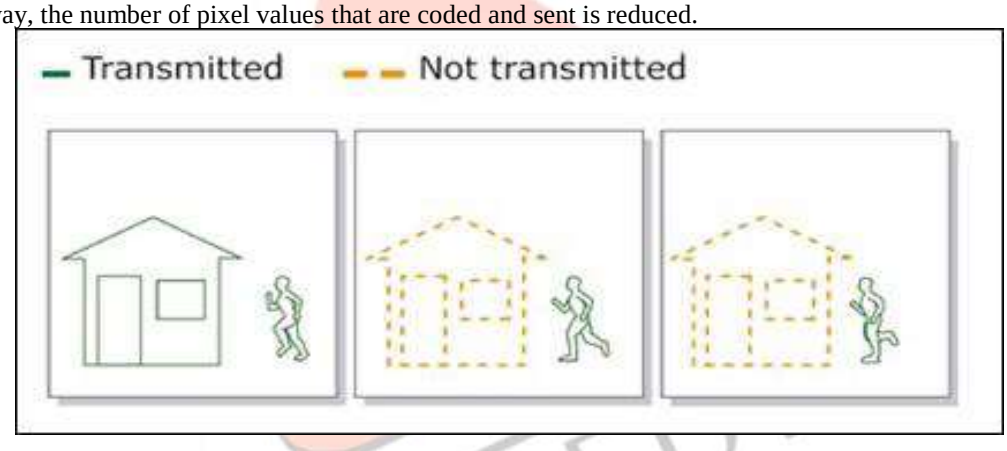
Following are the various compression algorithms can apply;

1) Video compression using DCT: - Discrete cosine transform is a lossy compression algorithm. That is discards those frequencies which do not affect the image as the human eye perceives it. For the two dimensional DCT the mathematical function is described as:

$$t(i,j) = c(i,j) \sum_{n=0}^{N-1} \sum_{m=0}^{N-1} s(m,n) \cos\frac{\pi(2m+1)i}{2N} \cos\frac{\pi(2n+1)j}{2N}$$

The DCT makes the transformation of stationary image into the frequency domain. The total frame is divided into *blocks of 8x8 pixels. The DCT* algorithm changes the spatial information inside the block into the frequency domain. Later than the alteration, the peak left value of the block symbolizes the DC level of the block. The value right away to the right of this represents short frequency horizontal information. Value on the peak right symbolizes high frequency horizontal information. Likewise, the bottom left value symbolizes high frequency vertical information. DCT transformed values holds a precise illustration of original macroblock. By applying an inverse DCT on the values we get back our original pixels. DCT amount produced at this time detained as high accuracy (e.g. floating point) values. Here applied a method called *quantization to decrease the* accuracy of the values. Quantization only means storing the value by means of a discrete number of bits, removing the smallest amount of important information.

2) Frame Skipping using difference coding for video compression:- Frames skipping is nothing but Reducing the number of frames to improve the overall quality of the encoded video and reduces the jerkiness associated to the skip ;algorithm determines the minimal number and the exact positions of the frames that must be skipped in order to achieve, for a given coding quality, a predetermined target bit rate. In a series of frames, as per predetermined skip count video data can be reduced by such methods as difference coding, which is used by most video compression standards including H.264. In difference coding, a frame is compared with a reference frame and only pixels that have changed with respect to the reference frame are coded; In this way, the number of pixel values that are coded and sent is reduced.



III. MEASURING PARAMETER

Following parameters are subjective measure of degradation of video after the compression.

1. PSNR (peak signal-to-noise ratio):

PSNR is measured for degradation of video after the compression. PSNR is ratio between the maximum Possible power of a signal and the power of corrupting noise.

$$PSNR = 10 * \log \frac{255^2}{MSE}$$

2.MSE (Mean Square Error):

The MSE represents the cumulative squared error between the compressed and the original image. The mean square error is the average of the squared errors between actual and estimated readings in a data sample.

$$MSE = \sum_{i=0}^{x} \sum_{j=0}^{y} \frac{(|Aij - Bij|)}{x * y}$$

4. CR (Compression Ratio):

The compression ratio between two videos: the original one and the compressed one coming out of video encoder, which is measured by equation as below:

$$Compression\ Ratio = \frac{Compressed\ data}{Uncopressed\ data}$$

IV. RESULT AND DISCUSSION

We have modified and compared various video compression algorithms based on video compression using DCT & Frame skipping method i.e. Algorithm consist 64x64 and 32x32 DCT matrix & frame skip algorithm for full length video. Here output can be calculated at 4 various bit rates for same video. All these algorithms are implemented using MATLAB. Table 1 shows measuring parameters output for 64x64 DCT matrix algorithm for video.; Table 2 shows measuring parameters output for 32x32 DCT matrix algorithm for video. Table3 Shows Measuring output for frame skipping method .& skip count set to 70.

SR.NO	Video file name	Original video size(bits)	Compressed video size(bits)	PSNR	MSE	COMPRESSION RATIO
1	Claire90k_1.avi	8821452	124724	25.3515	189.6755	70.7277
2	Claire90k_1.avi	8821452	502976	28.1432	99.7265	17.5385
3	Claire90k_1.avi	8821452	1131696	31.2614	48.6576	7.7948
4	Claire90k_1.avi	8821452	2011904	34.1431	25.0530	4.3846

Table 1. Video compression using DCT(64x64 matrix) results
BIT RATE= 128:128:512

SR.NO	Video file name	Original video size(bits)	Compressed video size(bits)	PSNR	MSE	COMPRESSION RATIO
1	Claire90k_1.avi	8821452	501956	29.8670	67.0556	17.5741
2	Claire90k_1.avi	8821452	2011904	35.9062	16.6954	4.38462
3	Claire90k_1.avi	8821452	4526784	40.5183	5.7728	1.94872
4	Claire90k_1.avi	8821452	8047616	42.8091	3.4060	1.09615

Table 2. Video compression using DCT(32x32 matrix) results
BIT RATE= 128:128:512

Sr No	Video file name	Original video size(bits)	Compressed video size(bits)	PSNR	MSE	Compression ratio
1	Claire90k_1.avi	1721267484	61316140	20.5672	0.0091	28.0720
2	Claire90k_2.avi	1721267484	238448320	22.5517	0.0065	7.2186
3	Claire90k_3.avi	1721267484	529009260	22.8434	0.066	3.2537
4	Claire90k_4.avi	1721267484	919711308	23.5672	0.0069	1.871

Table 3.Video compression Frame skipping method
Bit rate:15:15:200
Skip count:70.

V. CONCLUSION

The Compression Algorithms of DCT & frameskip are applied to the video and compared the parameter values using simulator tool. This shows that a compression scheme which minimizes the average video size and provide PSNR & MSE values for it. And conclude that the results of compression using DCT algorithm for 64x64 &32x32 DCT matrix are always better than other conventional technique. The comparative analysis for parameter like PSNR values of designed algorithms for 32x32 DCT Matrix gives better performance enhancement & values >35dB.& designed 64x64 DCT matrix algorithm provide comparatively fair compression ratio

REFERENCES

[1] Jens-Rainer Ohm, Gary J. Sullivan, Thiow Keng Tan "Comparison of the Coding Efficiency of Video Coding Standards—Including High Efficiency Video Coding (HEVC)", IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 22, NO. 12, DECEMBER 2012.
[2] Paramjeet kaur, Er. Sugandha Sharma and Er. Satinder pal singh Ahuja, "Latest Video Compression Standard H.264 Within Video Surveillance", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, issue 1, January 2012.
[3] Jaya Krishna Sunkara, E Navaneethasagari, D Pradeep, & E Naga Chaithanya "A New Video Compression Method using DCT/DWT and SPIHT based on Accordion Representation", I.J. Image, Graphics and Signal Processing, 2012, 4, 28-34.
[4] Deepak Dembla Biren Patel Ashish Kumar Dr. Yogesh Bhomia,"Comparison of H.264 and MPEG-4 Codec Based on PSNR-Peak Signal to Noise Ratio Algorithm ",I.J OF

Advanced Research in Computer Science and Software Engineering,Volume 3, Issue 3, March 2013 ISSN: 2277 128X
[5] G. Côté, B. Erol, M. Gallant and F. Kossentini,"H.263+: Video Coding at Low Bit Rates", IEEE Trans. on Circuits and Systems for VideoTechnology, Vol.8, No.7, Nov.1998.