DOI: 10.21276/sjet

Scholars Journal of Engineering and Technology (SJET) **ISSN 2321-435X (Online)**
Sch. J. Eng. Tech., 2017; 5(6):270-275 **ISSN 2347-9523 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

Compression of Video Using JPEG2000 (J2K)

Mala Sinnoor
Dept of Electronics and Communication, Dr. AIT, Bangalore-560 056, India

***Corresponding author**
Mala Sinnoor
Email: malasinnoor@gmail.com

Abstract: JPEG2000 (J2K) to compress the video and also maintains the quality of the video. JPEG2000 (J2K) to compress the video on three concepts: storing the video sequence frames to provide quality and spatial resolution scalability, prediction and conditional replenishment of code-blocks. B-frame technique is employed to compare the video. This paper provides considerably better interactivity compared to existing schemes and can adapt immediately to interactive changes in client interests.
Keywords: JPEG, JPEG2000, Wavelet transformation, Quantization, Compression.

INTRODUCTION

JPEG

Due to the increasing demand for amazing graphic design in low-band on the one hand and in heavy duty applications such as GIS on the other, image compression has gained great attention over the last two decades. Video takes up a lot of space, so video must be compressed before it is put on the web. “Compressed” just means that the information is packed into a smaller space. JPEG is the "Joint Photographic Experts Group" is used to compress the image /video. Typically compression will be of 10:1 ratio with loss in the image quality. A photograph that takes 1 MB to store in a Windows BMP file can usually be compressed down to 50 KB with JPEG.

JPEG2000 (J2K)

The compression rate can still improved by JPEG2000 (J2K) which is the advance version of JPEG. J2K not only increase the compression rate but also improved scalability and editability. Very low and very high compression rates are supported in JPEG 2000. JPEG 2000 compresses the video using wavelet technology. Advantage of JPEG 2000 is its ability to display images at different resolutions and sizes from the same image file. Because JPEG 2000 is based on wavelets, the wavelet stream can be only partially decompressed if the user only wants a low-resolution image, while the full resolution image can be viewed if this is desired. If an image was available for download on the Internet, someone with a fast Internet connection could download the full resolution image, while someone with a slower connection could choose to save time by downloading a lower-resolution image. The ability to display a single file with different resolutions also promises to be helpful in many industry applications where a certain image may need to be displayed with only a low resolution at times, while in other processes a clearer picture may be needed. Using JPEG, a different file would need to be generated for each picture. Using JPEG 2000, the same image file could be used, and the user could choose at what resolution to display the image [4, 5].

IMPLEMENTATION OF THE PROPOSED SYSTEM

The video is encoded by extracting avi file from the data base. Video coding is done by using JPEG2000, before we approach to the encoder part the video should be pre-processed. The pre-processing stage preparers side-information of frames. Then the user will have two choice:

1) **Spatial Scaling**: In spatial scaling the original video can be reduced to half or quarter size. Here the original image is reduced to half.

2) **Region of Interest**: In region of interest the user can select the interesting part of the video so that only that part will be of high resolution and remaining part will be of low resolution.

Input to J2K encoder is either of the above choice. Block diagram of "Flexible video encoding uses JPEG2000 (J2K)” is shown in figure 1.

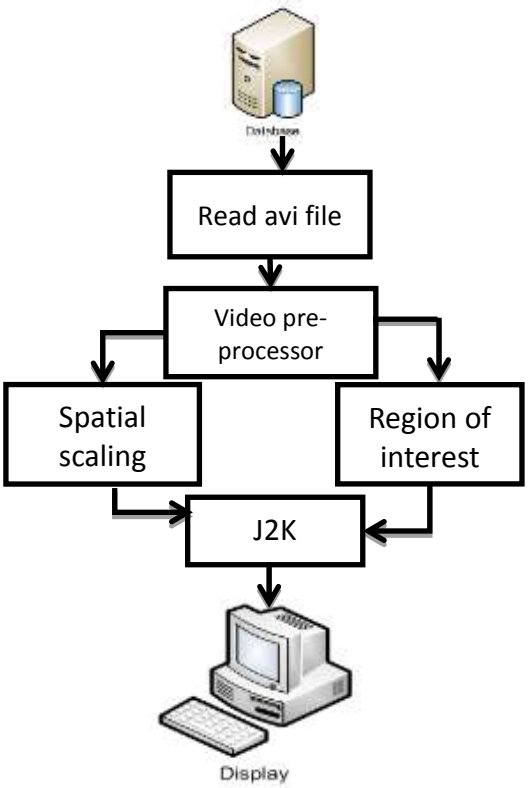

Fig-1: Block diagram of flexible video encoding uses JPEG2000 (J2K)

Each stage of the block diagram are explained

Video Pre-processor

In this stage video files will be extracted to each frame into JPEG2000 format and also calculates height, width and total number of frames of the video. Further JPEG images will undergo colour transformation. A monochrome image requires just one number to indicate the brightness or luminance of each spatial sample, whereas colour images require at least three numbers per pixel position to accurately represent colour. Colour transform that convert RGB images to gray scale.

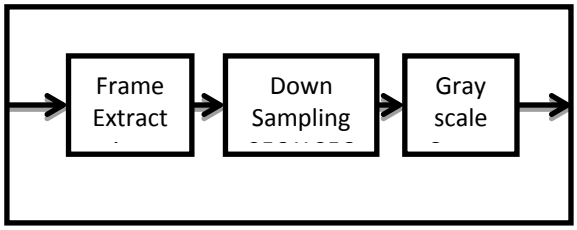

Fig-2: Shows stages of video pre-processor

Spatial Scalability

Spatial scalability is a technique to code a video sequence into two layers at the same frame rate, but different spatial resolutions. The base layer is coded at a lower spatial resolution. The reconstructed base-layer picture is up-sampled to form the prediction for the high-resolution picture in the enhancement layer. If the spatial resolution of the base layer is the same as that of the enhancement layer, i.e., the up-sampling factor being 1, this spatial scalability decoder can be considered as SNR scalability decoder too. Unlike the SNR scalability decoder in MPEG-2, the above spatial scalability decoder does not include the enhancement-layer information into the prediction loop. Therefore, if the corresponding encoder does not include the enhancement layer information into the prediction loop either, the base-layer drift does not exist [6].

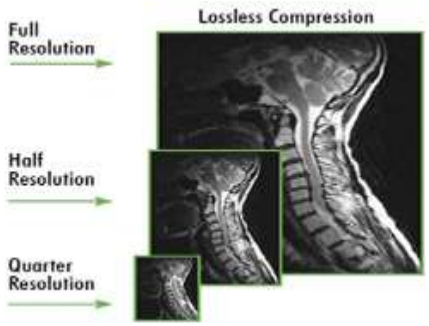

Fig-3: Image scaled to different resolutions

Region of Interest

If the client is interested in an arbitrary spatial region, then use of wavelets allows to select that particular part of area of an image to view at a high quality, while leaving the rest of the image at a lower quality. This allows the user to only view a necessary portion of the image instead of the entire. This significantly reduces the amount of memory the image requires, and the amount of time required to access the image. It will download only the requested part of a picture, saving bandwidth, computer processing on both ends and thereby saving time [3].

Fig-4: Encircled area which is the region of interest is of high quality and rest of the image is of low resolution

J2K ENCODER

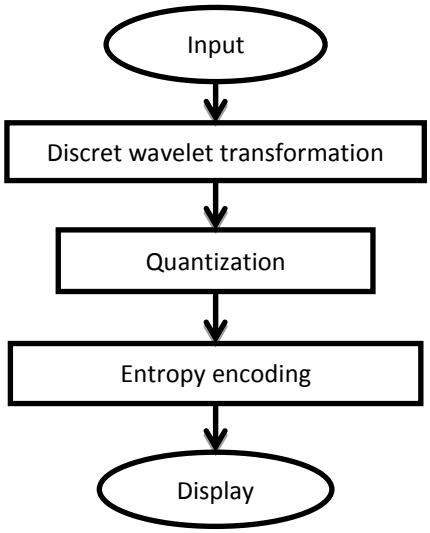

Fig-5: J2K Encoder

Wavelet Transformation

After color transformation in video pre-processing step, the image is split into tiles, rectangular regions of the image that are transformed and encoded separately. Tiles can be any size, and it is also possible to consider the whole image as one single tile. Once the

size is chosen, all the tiles will have the same size. Dividing the image into tiles will use less memory to decode the image and it can opt to decode only selected tiles to achieve a partial decoding of the image [1].

These tiles are then wavelet transformed to an arbitrary depth and this produces as many coefficients as there are pixels in the image. These coefficients can then be compressed more easily because the information is statistically concentrated in few coefficients. This principle is called transform coding.

Fig-6: Three -level wavelet transformation

Quantization

Quantization is the process of limiting the value of a function at any sample to one of a predetermined number of permissible values, so that it can be represented by a finite number of bits in a digital world. After the wavelet transform, the coefficients are scalar-quantized to reduce the number of bits to represent them, at the expense of quality. The output is a set of integer numbers which have to be encoded bit-by-bit. The parameter that can be changed to set the final quality is the quantization step: the greater the step, the greater is the compression and the loss of quality.

Entropy Encoding

Entropy Encoder converts a series of symbols, of the video sequence into a compressed bit stream, suitable for transmission or storage. Entropy encoding looks at the overall frequency of the specific values, wherever they are located. The data stream to be compressed is considered to be a simple digital sequence, and the semantic of the data is ignored. There are two coding methods: Huffman coding and Arithmetic coding. Huffman coding is adopted to implement the system.

Huffman coding

When coding the symbols of an information source individually, Huffman coding yields the smallest possible number of code symbols per source symbol. In trems of the noiseless coding theorem, the resulting code is optimal for a fixed value of n, subject to the contraints that the source symbol be coded one at a time [2].

RESULTS

1. Original video clip is of 2.6Mb and number of frames 887, b-frames=20, height and width 320 x 240 of frames

Fig-7: Video clip

2. Spatial Scaling

Fig-8: Left side is original clip and right clip is scaled to 128 x 128

3. Region Of Interest

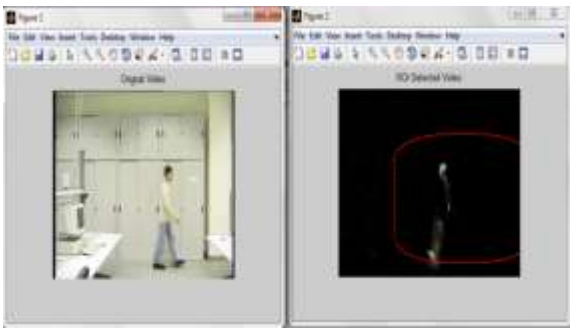

Fig-9: Left side clip is the original and in the right clip region is selected

4. Below table indicates test results after validation

	no. frame	h x w of frames	Comp ratio	PSNR (dB)
Original video	20	320 x 240	---	---
Spatial scaling	20	128 x 128	44.68	3.171
ROI	20	256 x 256	55.37	3.115

5. Performance of the proposed system is shown in two figures:

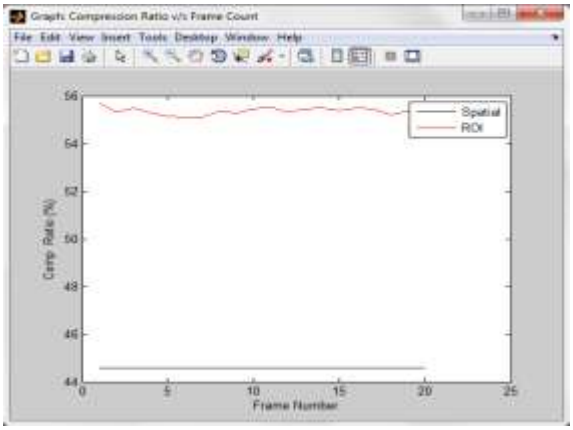

Fig-10: Compression ratio v/s number of frames for spatial scaling and ROI

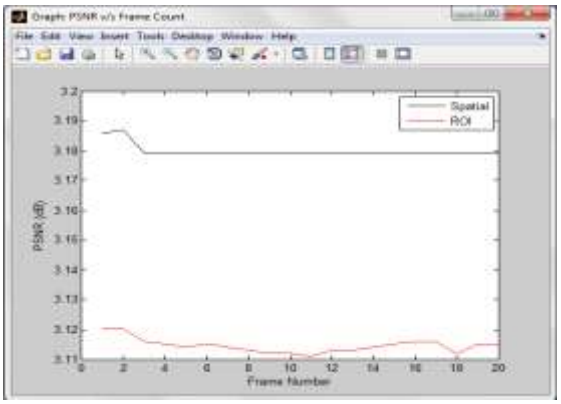

Fig-11: PSNR(dB) v/s number of frames for spatial and ROI

CONCLUSION

As illustrated, JPEG 2000 is sure to be the next standard for image compression. It offers numerous benefits over current compression methods, including the ability to do both lossless and lossy compression, the ability to obtain higher image quality and higher compression ratios, and the ability to view the same file at multiple resolutions. It also allows one area of the image to be examined more closely using its region of interest capability.

REFERENCES

1. Lim SJ. JPEG 2000 and Digital Watermarking Technique Using in Medical Image. 2009 Third IEEE International Conference on Secure Software Integration and Reliability Improvement, 07/2009.
2. Feng G, Wei LQ, Stephen E. Reichenbach, and Mark A. Neifeld. Visual Information Processing XV, 2006.
3. Naman AT, Taubman D. JPEG2000- Based Scalable Interactive Video (JSIV). IEEE Transactions on Image Processing, 2011.
4. Yufeng Z, Chen G, Wang Z, Blasch E. Image quality (IQ) guided multispectral image compression. Sensing and Analysis Technologies for Biomedical and Cognitive Applications, 2016, 2016.
5. Naman AT, Taubman D. JPEG2000- Based Scalable Interactive Video (JSIV) With Motion Compensation. IEEE Transactions on Image Processing, 2011.
6. Advances in scalable video coding. Proc. IEEE. 2005; 93(1): 42–56.