An Adaptive Search Algorithm to Estimate the Motion in SNR Scalable Video Coding

Rajkumar Maharaju, Madhu Damera, Srikanth Yalabaka

Abstract: ***The need of video applications such as, video telephony, video conferencing and live streaming video etc. increasing since years. The advancement in technology provide various devices included the capabilities of quality and resolution in broad range. These is one of the reason to motivating the researchers to improve the scalability in processing the video so that when various devices had network bandwidths may have different resolutions as well as quality. As it can be known Scalability in these three modes i.e., temporal, spatial and SNR. In this paper looking at SNR scalability with an Adaptive search algorithm to estimate the motion which can be reduced the computational time of video encoding.***

Keywords: Motion estimation, Scalable Video Coding, SNR Scalability.

I. INTRODUCTION

Since last decade, the technology in networking went through tremendous advancement which could be forwarded to the various applications towards improvising quality in video, speech etc. The usage of different kinds of transmission techniques and storage technologies is pre-determined. The utilization of different wide rang devices varies from one and other in different aspects like processing power, quality, resolution are increasing rapidly. The solution for these problem is inclusion of stability which evolved in modern era. The features that attracted many researches are:

i. To be generated the bit stream should be adaptable for variations with in the band width.

ii. The quality of the video must be optimized. So this made SVC become most attractive Research area and make more reliable and practical efficient video to do Motion compensation and estimation.

II. BACKGROUND THEORY

The compressed video signals are most important in multimedia techniques and communication systems. Bandwidth should be taken care all the time according to the human point of view, the amount of information should be reduced and send to a specific sequence of frames while the quality at output must be desirable level. In the year 1960, video compression had initialized, The use of DPCM started in video codec in 1970.The encoder information may not be same to the decoder information because it uses the recursive loop in it and the difference may leads to drift so results in remarkable artifacts. The implementation of 3D sub band coding is makes the inherent drift issue due to DPCM, this results leads to requirement of a big amount of memory needed and occurrence of sequential splitting. MPEG investigates this technology in detail then come up with a new standard and technique in video coding called scalability. H.2 64/AVC is the 1st project on SVC in MPEG. Later the researches motivated towards SVC to work on and improve its Efficiency. Afterword's Discrete Wavelet Transform technique based coding made to use 3D wavelet transform. Motion Compensation is a method used to Encode and achieving desirable compression from the object information when it is in the motion. Estimating the motion is find out the vectors by observing the motion of the particular object in video. MC&ME plays a major role and helps in scalability process to be done properly.

III. SNR SCALABILITY

In the scalability processing, the Encoding method producing the output bit stream consists of how many number of compressed information layers. The construction of an image is acceptable when one or more layers are removed while reconstruction process. The base layer consists of data, and the requirement is to at least have the video. A low resolution output and high resolution video is obtained while the decoder is doing the decoding from Base layer. Stability divided by three aspects that are Spatial, Temporal and SNR scalability.

SNR scalability is used to the less amount of information of whole part of the image i.e., it is done on the basis of quality, so it is called as Quality Scalability.

The SNR scalability is divided into 3 modes:

i. Corse grain SNR (CGS).

ii. Medium grain SNR (MGS).

iii. Fine Granual SNR (FGS).

The CGS is obtained by the same process so it will be used in spatial scalability .The MGS scalability is an idea of variation in Quality refining technique which is used in CGS.FGS uses Bit plane coding which is one of the improved techniques for Encoding process.

IV. ADAPTIVE SEARCH ALGORITHM TO REDUCE COMPUTAION TIME TO OPTIMIZE MOTION ESTIMATION

Estimation the Motion is a process of checking whether the objects in video are in motion or not.

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The motion vector is obtained according to the degree of displacement. This is a time taking process. So, time of computation is desirably reduced which in turn increases efficiency. Full search algorithm is the best on among all the search methods. In this algorithm, the first and second frames are taken as reference and current frames respectively. For next incoming frame becomes current frame and last current frame act as a reference to the next current frame. This follows until the process ends. To perform these operations must add the zero padding on frames because the search region must be covered all the blocks of the frame along with neighboring blocks. This search is continued until the objects in video occurred with motion. Then the cumulative values will be taken and adding could be done. The value obtained from Motion Estimation will be examined and compared with a desired threshold value. If it is lesser than the threshold then motion vector is taken according to coordinates of corresponding frame. The method explained is as follows with flow chart:

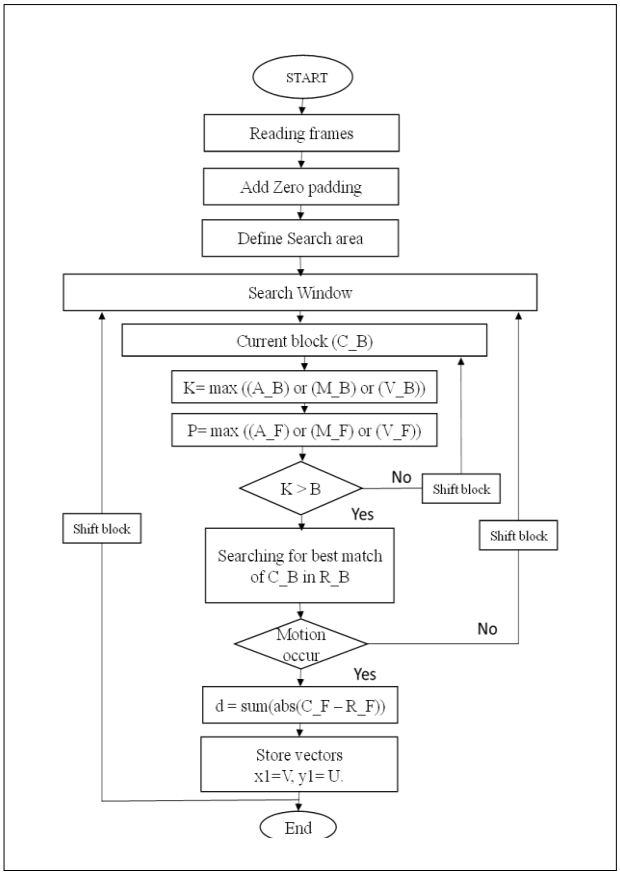
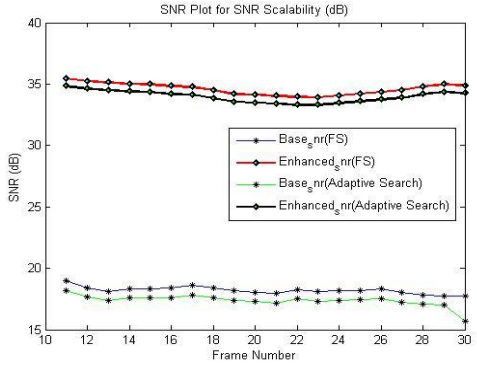


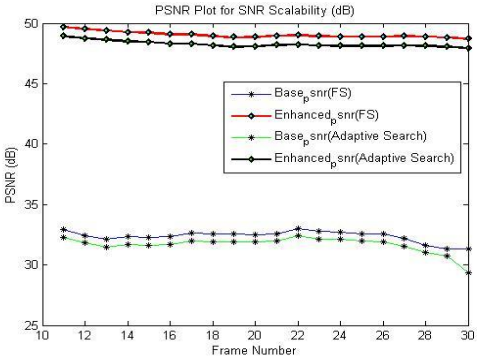
Fig. 1 Flow chart for Adaptive Search Method

V. EXPERIMENTAL RESULT WITH DISCUSSION

The results obtained from the above sections are tabulated below with the intention of comparison. The mean values taken from Base and Enhancement layer for SNR as well as PSNR values and comparison taken place between conventional methods with adaptive search algorithms. In this paper the new Adaptive Search method is applied on four video sequences and the graphs of SNR and PSNR are shown below. The observed values are listed in Table I and II as it shown below. In Table III the computational duration shown for both conventional and new Adaptive search method.

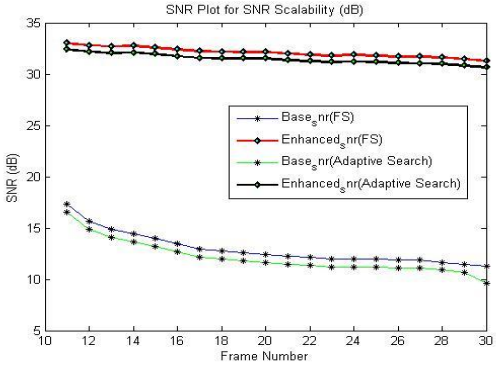


(a)

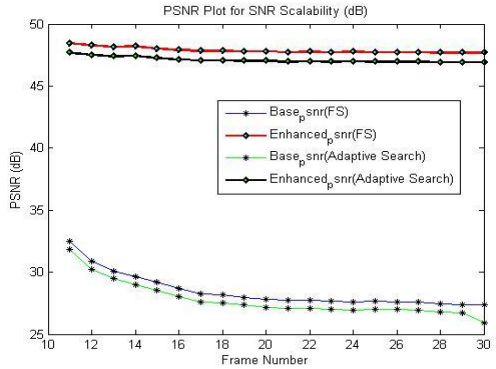


(b)

Fig. 2 (a) SNR (b) PSNR of the 'rhinos.avi' using Conventional and Adaptive Search method



(a)



(b)

Fig. 3 (a) SNR (b) PSNR of the 'Football.avi' using Conventional and Adaptive Search method

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Table. 1 SNR in dBs for Base (BL) and Enhancement layer (EL)

Video Sequence	Conventional Method		Adaptive search algorithm		Difference (dBs)	
	BL	*EL*	*BL*	*EL*	*BL*	*EL*
Rhinos.avi	17.45	33.94	16.19	32.22	~1	~1
Foreman.avi	17.35	32.20	15.91	31.90	~2	~1
Football.avi	15.26	33.49	13.59	32.62	~2	~1
News.avi	18.62	27.65	15.65	24.35	~3	~3

Table. 2 PSNR in dBs for Base (BL) and Enhancement layer (EL)

Video Sequence	Conventional Method		Adaptive search algorithm		Difference (dBs)	
	BL	*EL*	*BL*	*EL*	*BL*	*EL*
Rhinos.avi	33.79	48.28	31.52	47.55	~2	~1
Foreman.avi	29.46	47.30	27.01	47.01	~2	~1
Football.avi	29.87	47.10	27.20	46.23	~2	~1
News.avi	33.95	46.56	31.24	45.68	~2	~1

Table. 3 Computational duration in sec. for conventional search and Adaptive Search Algorithm

Video Sequence	Computational Time		Software & Processor
	Conventional Method	Adaptive Search Algorithm	
Rhinos.avi	62.082204	41.685453	MATLAB, Intel Core i3
Foreman.avi	25.523074	19.488602	
Football.avi	76.746783	52.008435	
News.avi	112.25648	48.56324	

VI. CONCLUSION

In the paper an Adaptive search algorithm has been developed which will reduce the evaluation time with negligible Quality difference (e.g. 1-2dB). Motion Estimation takes major role in scalable video coding. To reduce the Estimation Time to obtain Motion Vectors, the Particle Swam Optimization Technique can be adopted. PSO is one of the best technique to find P best and G best among particles. In order to implement PSO on pixels to obtain Motion Vectors to process the Video, this would be a tremendous improvement can be achieved in Communication research field.

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