

SVM Based Saliency Map Technique For Reducing Time Complexity In HEVC

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Abstract - In today's world, the concept of Digital technology is drastically increasing day by day. Many application of Digital video communication like broadcast services over satellites, digital video storage along with the wireless communication services etc. are commonly used. The data quantity has become very large in case of digital video and the memory for storing purpose and the requirement of bandwidth are not sufficient for such large amount of data. Thus, various video compression algorithms have developed for reducing the quantity of data in proper amount. Video compression technologies have become an important part of the Digital technology. HEVC is a High Efficiency Video Coding which offers the data compression at the same level of video quality and provides improved video quality at the same bit rate. However computational complexity increases due to the rate-distortion optimization process (RDO). So this paper presents a technique called Saliency Map Detection based on SVM which reduces the time required for the computational process and at the same time achieves comparable compression efficiency.

Key Words: HEVC, SVM, Saliency Detection, RDO, MATLAB

1. INTRODUCTION

HEVC which is also known as H.265, High Efficiency Video Coding, is a new video coding standard that specifies how to decode video. Higher efficiency generally comes with a complexity. H.265 is more difficult to encode as it requires a longer computational process. Basically, HEVC encoder and decoder processes on two searches, methods called Full Search and Hash search. In full search method, firstly the images often called as frames, of video are broken into some specified blocks and then each block of first frame is compared with the whole blocks of its next frame whether they are equal or not. So, in this method of full search block by block comparison is performed. So, the time required for processing became quite large. In case of Hash search, instead of block search feature search introduced in order to minimize the computational time. Features like mean, standard deviation, variance etc. of one block now compared with the next block. Ultimately, reduction in process timing occurred with the improving accuracy. In this paper, a

concept of Saliency Detection is introduced for further reduction in timing complexity and for better result in Encoding and decoding process.

2. TECHNIQUE FOR SALIENCY DETECTION

Visual saliency is the definite ability to interpret subjective quality which makes some objects different from their neighbors and immediately hold our attention. In computer vision, a saliency map is an image which shows each pixel's unique quality. The goal of this technique is to simplified and change the representation of an image into such a thing that is more meaningful and easy to analyze. Image segmentation is nothing but the Saliency. Saliency map technique is needed for image compression and image retargeting. There are basically 3 types of saliency.

Image saliency

Image saliency actually works on color contrast. A salient object differs significantly from another object in its local neighborhood. It has two approaches. First is Top-down approach in which it identifies important objects like face etc. Second approach is Bottom-up in which it analyses pixel values and compute saliency values for each pixel. (high pixel contrast) and then groups them into regions. This idea generated from human visual system which is sensitive to colors which rarely occur within an image.

Motion saliency

Detecting motion is a fundamental skill of human visual system. It analyzes motion of each pixel. Its approach is to analyze difference between consecutive frames i.e. from the given size, whatever size we select it will take its next frame for processing and then finds out the difference calculating what is in motion. In addition, because of these maps are very noisy it uses erosion and dilation steps to reduce noise and gives better result.

Depth saliency

It based on the assumption that objects close to camera are more relevant compared to other objects in background. Its approach is to identify pop-out regions by analyzing disparity if horizontal shift of pixel between left and right view. It actually defines the luminance difference by their

pixels of current and next pixel. This technique reduces optimization rate and hence resolution is increased.

3. PROPOSED METHOD

In this paper, a support vector machine based saliency map technique is used in order to reduce the computational complexity of HEVC. The required code for this algorithm is generated in MATLAB. MATLAB is a special purpose computer program developed by Mathworks. As it contains a library of predefined functions it is easy to operate with various engineering and scientific calculations. It has many advantages like graphical user interface, platform independence, device independent plotting etc. Image processing can be done with the help of MATLAB. The system overview can be described as shown in the fig below.

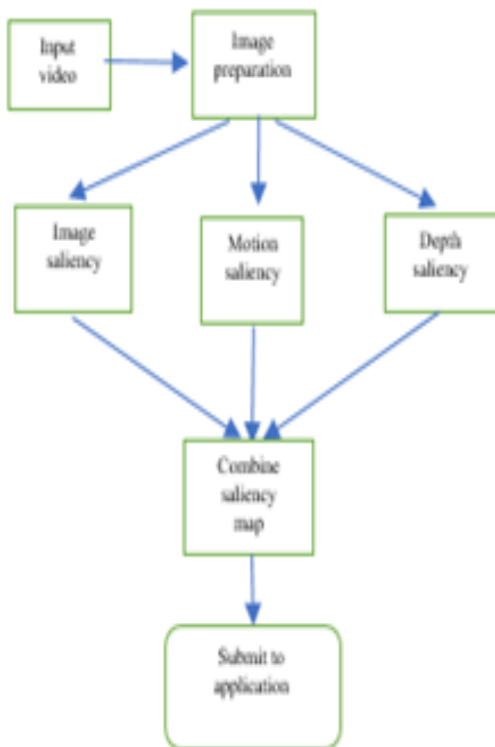


Fig -1: System overview

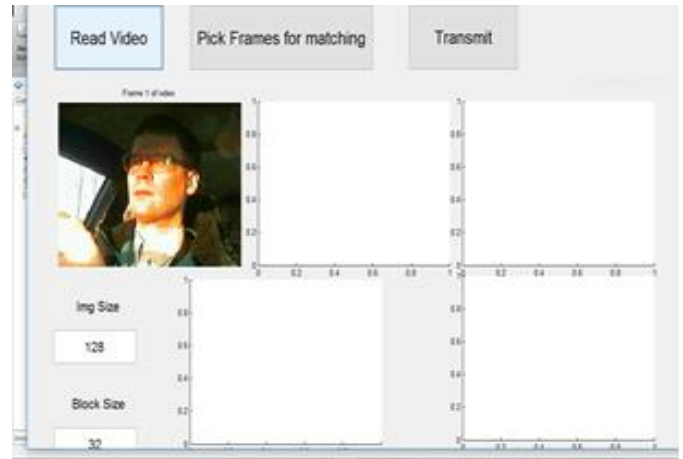
4. EXPERIMENTAL RESULT

The following steps can be followed for executing the procedure of this project.

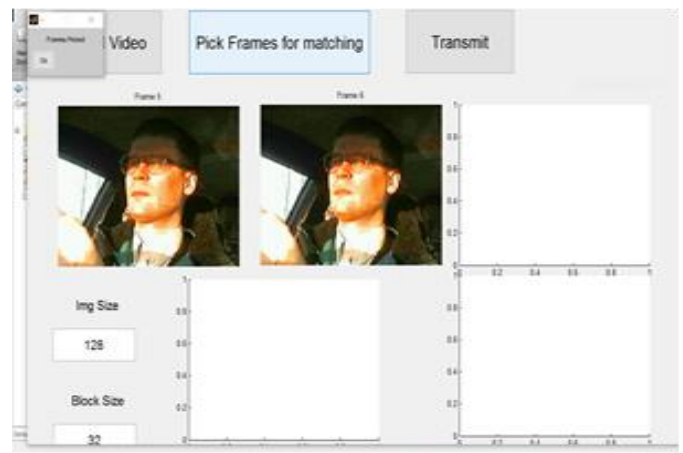
STEP 1: By opening MATLAB, first Browse the required folder on which all the codes of program are stored.

STEP 2: Then, on the command window by typing 'gui' which means graphic user interface, a new screen opens as follows. The image size and block size can be according

changed for comparing various results. It shows 3 steps to be followed i.e. Read video, pick frames for matching and last one is Transmit. Read video loads the full video.



STEP 3: By picking frames for matching generates the total number of frames of the video. Then by entering frame number the corresponding two frames displays on the screen i.e. current frame and next frame for comparing what is silent in both the frames.



STEP 4: In Transmit section, the all 3 methods displays which calculates the processing time for compressing the frames.

STEP 5: Entering SNR to an appropriate value, all values can be determined using all three methods. Full search and hash search are previous methods of calculating the processing time and compressing ratio. In this paper, the saliency detection is added to hash search for further reduction in computational complexity and for better result. An example of Saliency search method is as represented below for transmitting and reception time.



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Following table describes the reduction in timing as the process goes from Full Search to saliency search with SNR of 15. Image size 128 and Block size 32.

Table -1: Results in timings in various methods

Sr no	Search methods	Compression ratio (%)	Transmit time (s)	Receive time (s)
1	Full search	49.7396	11.2897	0.0365
2	Hash search	49.9837	0.1422	0.0313
3	Hash search with saliency	49.9837	0.0657	0.031

5. CONCLUSIONS

The above table shows that the approximately 50% of compression is done in all methods, but the transmitting time is significantly reduced to a very small time as compared to full search method. So, here it can be concluded that the computational complexity which occurred in first method is greatly reduces with minimizing the errors and hence it gives better results for transmitting the whole video along with the improvement in accuracy.