

# Saliency Map Technique for Reducing Processing Time in HEVC with the Help of MATLAB

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*Abstract*— Innovations in the communication systems have shown extraordinary change in the last decade. Technology in communication systems has transformed so fast in the Digital systems and hence Video traffic is getting dominating on both the wireless and wireline networks. HEVC is the High Efficiency Video Coding Standard used to reduce the video Compression rate so that the quality of the video is maintained with the proper bit-rate. In HEVC, the bit rate is reduced by half with respect to the previous standards but at the same time it increases the timing complexity which in turn reduces its functionality. The research presented here proposes a reduced complexity HEVC encoder by making use of SVM Classifier with the help of Saliency Map Technique. A new technique is implemented for reducing Timing complexity in HEVC. The results show reduction in complexity in terms of processing time for different videos sequences, with acceptable PSNR and bit-rates.

**Key words:** HEVC, SVM, Saliency Detection, RDO, MATLAB

## I. INTRODUCTION

Video coding schemes are mainly made up of two entities, an encoder and a decoder. The video encoders encode the input video signals to its compressed binary representation and the decoders decode such representation to an output video signal ready for consumption. This process is called video coding. The process of compressing a digital video signal into a smaller number of bits is called video compression. HEVC is such a video coding standard which provide the data compression with maintaining the video quality. It is a new video coding standard which specifies how to decode video. Complexity generally comes with a High efficiency. H.265 is quite difficult to encode as it requires a bit larger process of computation. Generally, HEVC processes on two search methods called Full Search and Hash search. In full search, block by block comparison is performed. It means, the whole images are broken into blocks and each block is compared with the blocks of next image. So, the time required for processing becomes quite large. In case of Hash search, instead of block search feature search introduced which further reduces the computational time. Features like mean, standard deviation, variance etc. of one block is compared with the next block. Hence, the process time gets reduced with the improvement in accuracy.

## II. SALIENCY DETECTION TECHNIQUE

While judging a region in a picture as salient or not, three properties are to be considered for determining whether they are salient or not, firstly salient regions are rare, salient regions are different from other, they should occur rarely, example blue flower in the bunch of red flower is salient.

Secondly, Salient regions must be repeatable, that means if the same picture is clicked 100 times from different angles, each time, same regions in the image appears salient. Also, Salient regions should be closed, rather than distributed that is localizable. The salient value of each pixel in a saliency map corresponds to how much attention may be focused on it. In other words, saliency describes what is prominent or noticeable. Visual saliency is the ability to interpret some objects different from their neighbors and immediately grab our attention. In computer terminology, a saliency map is a one type of image which shows each pixel's unique quality. The goal of this technique is to simplify and making changes in the representation of an image which is more meaningful and easy for analysis. image compression and image retargeting is performed with the help of Saliency Map Technique. There are 3 types of saliency.

### A. Image saliency

Image saliency actually works on color contrast. It has two approaches. First one is Top-down approach in which important objects like face etc. is identified. Second approach is Bottom-up in which it checks pixel values and compute saliency values for each pixel.

### B. Motion saliency

The fundamental skill of human visual system is Detecting motion. It analyzes motion of each pixel. Its approach is to analyze difference between consecutive frames In addition, it uses erosion and dilation steps to reduce noise and gives better result because of these maps are very noisy.

### C. Depth saliency

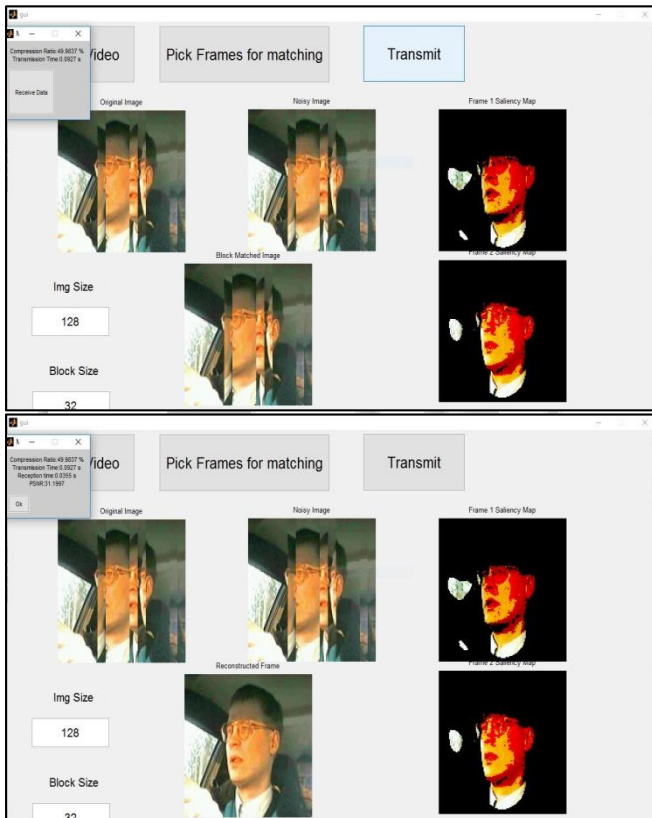
It based on one assumption that objects close to camera are more relevant compared to other background objects. It defines the luminance difference by their pixels of current and next pixel. This technique increases the resolution and reduces optimization rate.

## III. METHOD OF EXPERIMENT

In this paper, a SVM (support vector machine) based saliency map technique is used in order to reduce the processing complexity of HEVC. The code required for this is written and executed in MATLAB. MATLAB is a special purpose computer program. Here, this tool is chosen as it contains a library of predefined functions so it gives an ease easy to operate. It has many advantages and mainly Image processing can be done with the help of MATLAB. So, the total representation is done with the MATLAB. The all three techniques of HEVC, i.e. Full Search, Hash Search and the new technique that is Hash Search with Saliency Map have shown with their transmitting and receiving timings which would be able to find the accurate results of this method.

#### IV. EXPERIMENTAL RESULT

Firstly, by opening MATLAB, all the codes are stored and the required path has set. Then, by typing 'gui' on the command window, a new screen opens which shows 3 steps to be followed i.e. Read video, pick frames for matching and Transmit. Read video loads the full video. The image size and block size can accord changed for comparing various results. Then, we can choose any frame number from the generated total frames for matching. In Transmit part, the all 3 methods displays which calculates the processing time for compressing the frames. By Entering an appropriate value of SNR, all values can be determined. Previous methods like Full search and hash search are used of calculating the processing time and compressing ratio. In this paper, the saliency detection is added to hash search which results in further reduction in computational complexity and for better result. An example of Saliency search method is as shown in the following figures for showing transmitting and reception time.



Following table describes the reduction in timing as the process goes from Full Search to saliency search with SNR of 15. Following 2 tables describe the various values of Compression ratio, Transmission time, Reception time along with the PSNR with same Image size 128 and Block size 32

Sr no	Search methods	Compression ratio (%)	Transmit time (s)	Receive time (s)
1	Full search	49.7396	47.1975	0.037
2	Hash search	49.9837	0.2542	0.0331
3	Hash search with saliency	49.9837	0.0927	0.0355

Table 1: Results in timings in various methods

#### V. CONCLUSION

The results from various experiments based on Saliency Map Technique with different Image and Block size have come to the conclusion that the processing time required for compressing the frame gets reduced to a great extent so that the transmission time also gets reduced with minimizing the errors as the reconstructed frame was transmitted by removing the noisy signals. Hence, efficiency gets increased with minimizing the Computational Complexity. It can be also concluded that, larger block size produces more efficient processing as compared to smaller ones. Large block sizes enable better compression and hence provide better efficiency.

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