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Utilizing Global Redundancy in BSVD using RR- ERLC for Efficient Video Coding

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ABSTRACT

The big data era where the interval between the enormous increase in surveillance video size and stable video compression rate has become a necessity one. The video data rate is huge because video sequences include dozens of still images per second. Therefore, the characteristics of video and its needs must be necessary in the video compression methods for transmission and storing of video sequences effectually. The traditional compression methods with the known redundancies are unable to minimize the dominant redundancy embedded in the Big Surveillance Video Data (BSVD). Most of the data compression methods are not able to eliminate the redundancy in the surveillance video data's. A novel approach based on BSVD global redundancy is proposed and analyse the redundancy's compositions on the basis of its characteristics. To eliminate global redundancy, coding framework is employed. In this paper, Redundancy Removal based Enhanced Run Length Coding Scheme (RR-ERLC) is proposed to reduce the storage capacity of surveillance video data's. To overcome the issues, the proposed method encodes the frames by removing the redundancies using the texture information similarity in the surveillance video. Simulated results reveal that this approach can attain a greater compression rate for huge dataset of surveillance videos and also provides better performance than the existing.

Keywords: Run Length Coding, BSVD, Global Redundancy, Compression, Display Frames; Similarity Measure.

I. INTRODUCTION

Surveillance video became a key in real time application. It makes the process to have efficient communication and control access from wherever at any time. All over the world this network becomes a major part and increased day by day. Video is a conspicuous the data in the communication systems with the analysis of consequence. The recent report of the application provides a huge amount of big data from surveillance up to 65% and for the next period it will carry on.

In real time, the recent applied application of big surveillance video data (BSVD) is extensively used in quick transference and free safety. It helps to visualize the real time happing like accidents, human identification, support on exploration and avoidance of illegal happenings. To have efficient process a standard technique of video coding is required for random signals of the videos and Images, transform and analytical process, and path quantization. However, the storage of the long-time video will pressure by the huge data volume and high resolution.

In order to reduce the storage space and the time with efficient and the domain supporting process, such data's are necessary to compressed. The basically compression approach includes the redundancies of temporal and spatial. The surveillance video has a correlation inter - frame lag in the data so it is suitable for video coding with better ratio of compression without data losses.

In video compression the resolution and the quality accuracy is more important to have an efficient process. Normally, it achieves an intensity of the images or videos in the compression process. During the

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video transmission the compression considers the frames with bandwidth in wireless multimedia communication. It includes with a huge space for storage and bandwidth. The frames are compressed to reduce the capacity of space to store and to communicate. According to the bandwidth the transmission of data is carried out and the live process is carried out by the surveillance technique.

In digital application, it is cost efficient and based on the ratio of compression the efficiency of the approach is estimated. The compression technique is mainly used for the purposes of bandwidth and storage reduction needed for the application.The rest of the manuscript is organised in section wise. The discussion of the video coding approach survey is carried out in section II. The proposed approach explanation and the implementation are carried out in section III. In section IV, performance analysis of the proposed approach and the existing is presented. Finally the conclusion of the manuscript is in section V.

II. LITERATURE SURVEY

In this section, the survey of video coding and the various approaches is discussed. Day to day the compression rate is becoming noticeable with the fast process, size and the stability of the video data. The redundancy of the big surveillance video data (BSVD) is determined with the global redundancy based video coding with surveillance appearances. The avoidance of global redundancy provides the system efficient and better performance [1].

The approach of Transform domain Wyner-Ziv (TDWZ) video coding is applied and implemented on the basis of compressing the discrete cosine transform in distributed video coding. Instead of wavelet the Set Partitioning In Hierarchical Tree (SPIHT) is executed in the system to have fast and efficient technique for compression [2].Based on a markov process of 2D the transform and the interframe coding are carried out with the conventional. As well as the existing block pixel of neighbour is copied the reconstructed in order to predict the pixels. It performs with the internal block of the angular direction. For the improvement of intra prediction the recursive prediction approach is implemented [3].

The redundancy mechanism of Global Object Redundancy (GOR) is obtained the movement of the vehicles and it is based on the features and the model. It establishes the parameters with better quality accuracy for coding and transmission. It processed for long term process for the assurance of quality image [4]. In order to reduce the high definition network of video transmission the compression process is designed and developed. An Adaptive Golomb–Rice coding scheme based context modelling is implemented in conjunction for complexity reduction and an adaptive arithmetic coder is used in it [5].

In the application of brain function monitoring the Nonlinear Interdependence (NLI) approach is implemented. It directly measured the activities of regions in the brain and adapts the signal of neural with the size increasing. However, it is not applied in the multivariate signal handling. By the general-purpose computing on the graphics processing unit (GPGPU) based parallelized NLI method (G-NLI) is determined management of parallel process and the measurement of the system obtained [6].However, the conventional PARAFAC is implemented in the medial application, for the analysis of offline data because of high complexity with the data size increasing. For a large-scale GPGPU based PARAFAC method has been proposed to have better measurement and analysis of data with the observations of clinical [7].

Recently removal of scenarios has increased incredible in the scenario and it is demonstrated as a flexible and independent agent driven by the mechanism of a decision-making based on weight. The parallel modelling of the GPGPU has reduced the overhead for the state access of global system and it is managed by the platform of GPU [8].

A task-tree based mosaicking is applied in the structure for remote sensed images with the scheduling of dynamic DAG at large scale. It states the model with the least height as a as a task of data-driven. The dynamical DAG scheduling resolution with CPDS-SQ is based on the critical path to provide an optimized schedule with minimal time achievement on the multi-core cluster. In order to have various pairs of images the approach is implemented with the MPI to have a scalable and flexible approach [9].

The contrast limited adaptive histogram equalization (CLAHE) Algorithm is proposed in the paper [10] for the reduction of noise and clarity in video with improvement. In order to have video with noiseless the frames of video is classified the Macro-blocks into various classes to determine the contents of frames by the vector.In the application remote sensing HPGFS is proposed with the interface of the system. The parallel system provides the policies with RS data objects for efficient access [11]. The compressibility constrained sparse representation (CCSR) approach is proposed in the paper [12] for the compression of images at low bit-rate. The compression technique is proposed along with the matching pursuit (MP) algorithms by using texture reinforcements of the dictionary.

The background-modelling-based adaptive prediction (BMAP) method is implemented for the purposes of prediction of background. The background difference prediction (BDP) predicts the data of the domain currently obtained and it improves the efficiency by the references of background [13].

In paper [14] the compression video analysis is based on the block SVD Algorithm. It reduces the representing of bits of video frames with the reduction of space for storage and the cost for the transmission during the management of good quality. It provides better performances of PSNR at the same bit rate with the complexity of time reduction.

The low-rank and sparse decomposition (LRSD) is used to compress the video with the component of low rank by representing the object, components and the background. The temporal redundancy is removed by the dependency of a linear process of background frames [15].

III. PROPOSED WORK

In this section, the proposed approach of Redundancy Removal based Enhanced Run Length Coding Scheme (RR-ERLC) is developed and implemented for the reduction of storage space, global redundancy, time for completion and the compression rate. In the proposed system, the initial stage is input data and the video is converted into frames for the next stage. After conversion the frames are classified by the features based on the salience features detection. Once it detected, then the frames are processed with the color space conversion to determine the individual layers.

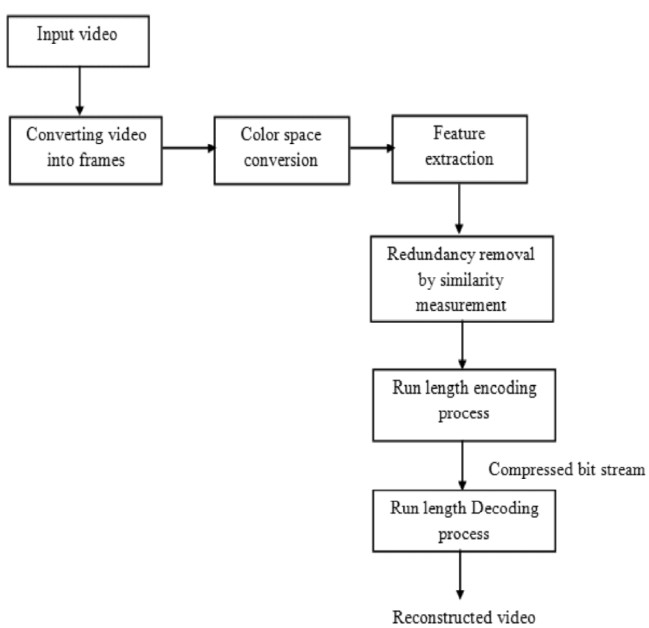

Figure 1: Work Flow of the Proposed System

Based on extraction method the features are extracted and applied to the next process of redundancy removal and for estimation of similarity measure. Then the data is encoded by the enhanced run length coding approach for the reduction of space and time. The compressed bit stream is obtained and decoding the process is implemented in the reverse process of encoding for reconstruction of video. Fig.1 shows the flow of the proposed system.

The process of redundancy removal and the feature extraction are carried out as per the procedure of the proposed approach.The salient feature is used to detect the data with the key attention mechanism which enables the process of availability of the data between the neighbours and items. It describes the visual of the data with the consideration of reactive process, bottom-up and the memory dependent. It integrated the influences by splitting it as top-down and bottom-up. It enables the ability for the allocation limits of resources for the input of visual quality. The visual process of model mechanism is determined as the visual salience detection. Then the frames are processed by applying the LAB color space.

In color space, it considers the dimension and the space as per the nonlinearity coordinates compression. It includes both the color model of CMYK and RGB. The 3D process is the L*a*b* model to coordinate the color with lightness. The transformations are considered according to the process of color space. The estimation of the salient feature (SF) and the procedure is given below.

Estimation of Salient Features (SF):

1. Read the input video
2. Split the video into frames
3. Convert the frames into LAB color space
4. Get the L,A,B layers from the LAB color space
5. Compute the mean for the each layers
6. Finally, calculate the salient feature by using the following formula.

$$SF = \sqrt{(\mathrm{l}-\mathrm{l}_{\mathrm{m}})^2 + (a-a_m)^2 + (b-b_m)^2} \quad (1)$$

Where, the layer from the color space are l, a and b. Here, l_m, a_m and b_m are the values of mean of color space layer respectively.

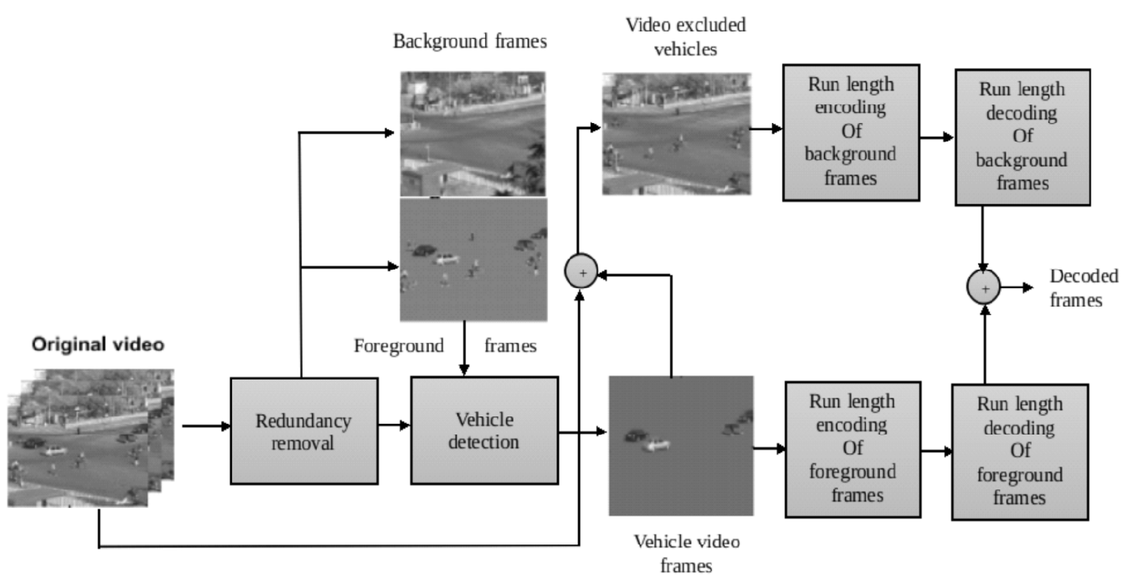

Figure 2

Fig.2 shows the block diagram of the proposed approach of the RR-ERLC. From the frames of salient features the texture features are extracted. Here the contrast (I), mean (m), correlation (C), entropy (E), energy (E_n) and homogeneity (H) are estimated by using the following expression. The features are extracted based on the salient data.

$$I(d,\theta) = \sum_{n,m} (n-m)^2 C(d,\theta) \tag{2}$$

$$m(\mathrm{T}) = \frac{1}{M \times N} \sum_{n=0}^{M-1} \sum_{m=0}^{N-1} T(n,m) \tag{3}$$

$$C(d,\theta) = \frac{\sum_{n,m} (n-\mu_x)(m-\mu_y) C(d,\theta)}{\sigma_x \sigma_y} \tag{4}$$

$$\mathrm{E}(d,\theta) = \sum_{n,m} C(d,\theta) \log C(d,\theta) \tag{5}$$

$$E_n(d,\theta) = \sum_{n,m} c^2(d,\theta) \tag{6}$$

$$H(d,\theta) = \sum_{n,m} \frac{1}{1+(n-m)^2} C(\mathrm{d},\theta) \tag{7}$$

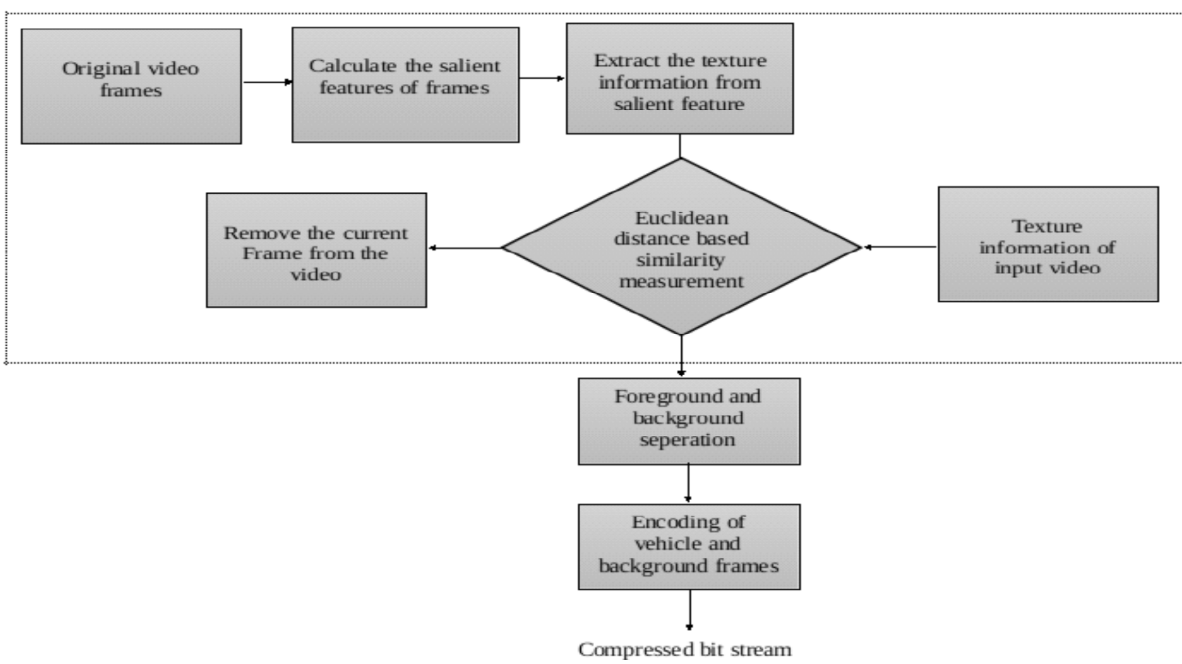

Figure 3: Block Diagram of Redundancy Removal

After the extraction of features the redundancy of the data is removed by applying the similarity measurement which determine the similarity features and remove the redundancy from the data. The input texture data is compared with the extracted features by implementing the method of Euclidean distance.

$$d_{st}^2 = (x_s - x_t)(x_s - x_t)' \tag{8}$$

Where d_{st}^2 is similarity feature measure x_s is input texture data and x_t is extracted feature.

According to the procedure if the features are same or similar then the corresponding input video frames will removed from the video. Fig. 3 shows the block diagram of redundancy removal from the video. The expression of removing redundancy is carried out as follow:

After the process of redundancy removal the frames are split into background and foreground frames. Finally, both the frames are encoded by the enhanced run length coding scheme. In this video coding the parameters are vary for encoding process. As well as, the decoding process is carried out as encoding in the reverse process.

Video Coding

Loop: count is equal to zero

Continue

Next symbol Obtain

Count = count ++

UNTIL (symbol ‘“ to next output symbol)

IF count > 1

Count Output

GOTO Loop

The coding process procedure given below:

1. Set the previous symbol equal to an unmatchable value.
2. Read the next symbol from the input stream.
3. If the symbol is an EOF exit
4. Obtain the current symbol.
5. If the symbol is doesn’t match the previous symbol, then set the previous symbol to the current symbol, and go to step 2.
6. The additional symbol is counted and initialize until a non-matching symbol is found. This is the run length.
7. Obtain the run length outcomes and the non-matching symbol.
8. Set the previous symbol to the non-matching symbol, and go to step 2.

IV. PERFORMANCE ANALYSES

In this section, the simulation results and the performance analysis of the proposed approach and the existing are discussed. Here the simulation of the proposed approach is carried out by using MATLAB/ SIMULINK.

Table 1
Comparison between existing and proposed bit rate savings

	Existing Method		*Proposed Method*	
	Vr versus Ori (%)	*Bg versus Ori(%)*	*Vr versus Ori(%)*	*Bg versus Ori(%)*
Video 1	-81.60	-99.58	-94.35	-94
Video 2	-77.03	-99.27	-85	-99
Average	-79.31	-99.42	-89.67	-96.50

Table 2
Comparison between existing and proposed PSNR Ratio and Execution Time

	Existing Method		*Proposed Method*	
	PSNR (dB)	*Execution Time (Seconds)*	*PSNR (dB)*	*Execution time (Seconds)*
Video 1	16	302.82	17.71	244.21
Video 2	15.5	195.95	28.19	137.07
Average	15.75	249.38	22.95	190.64

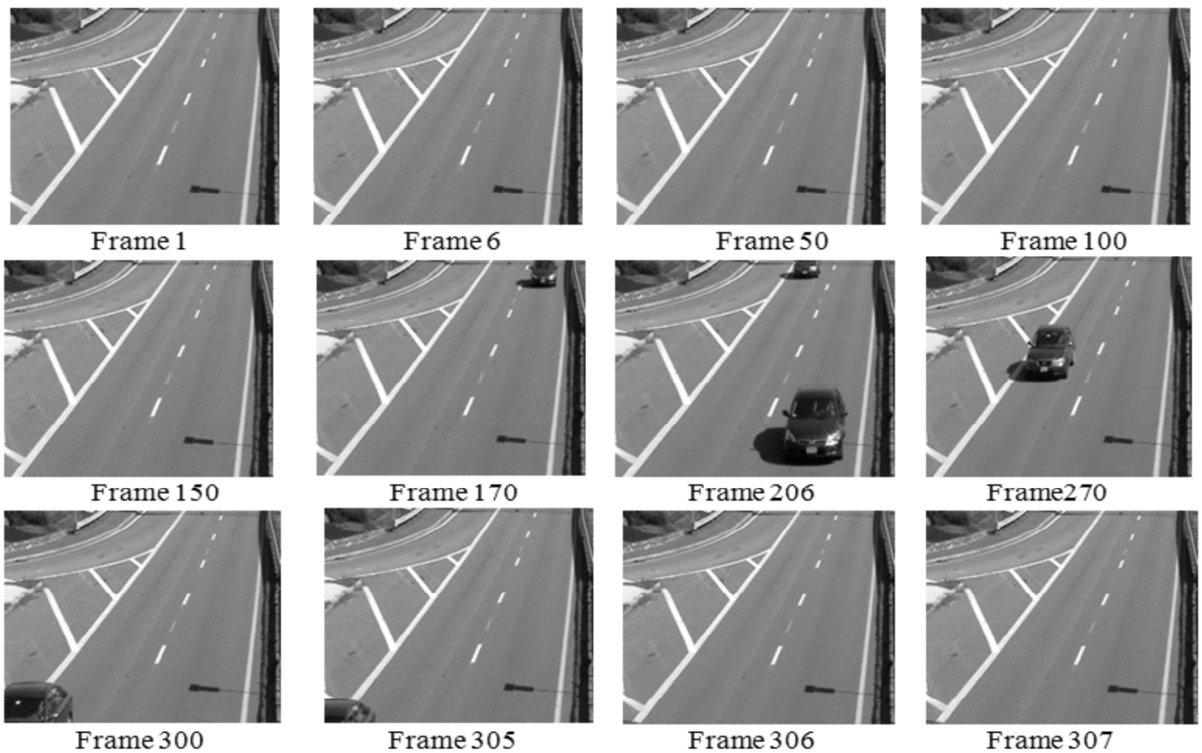

Figure 4: Input Frames

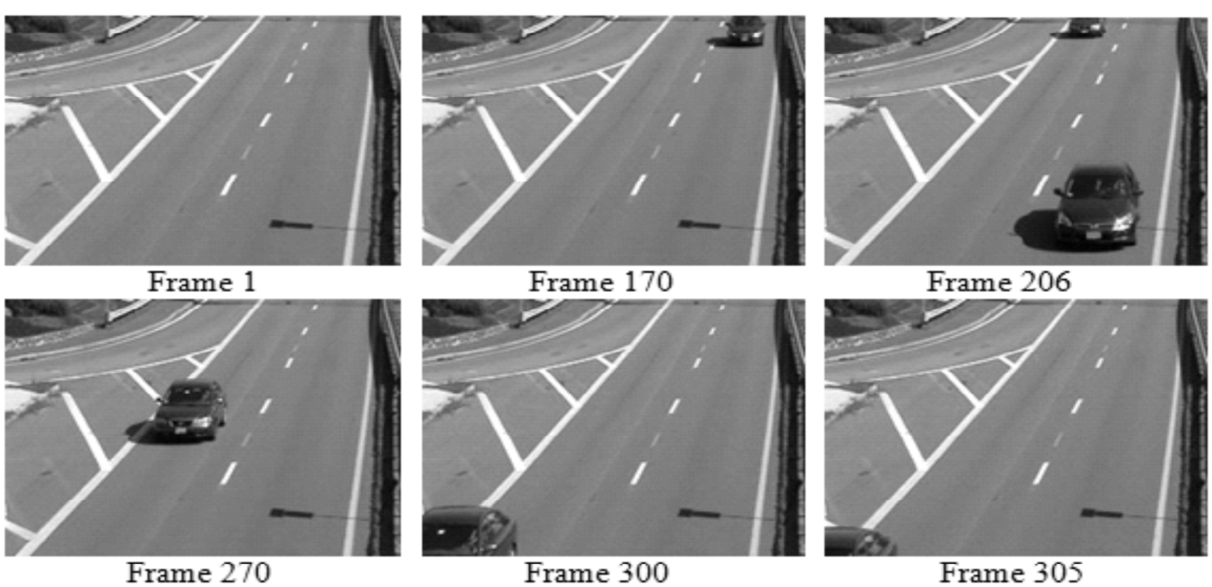

Figure 5: Frames with Redundancy Removal

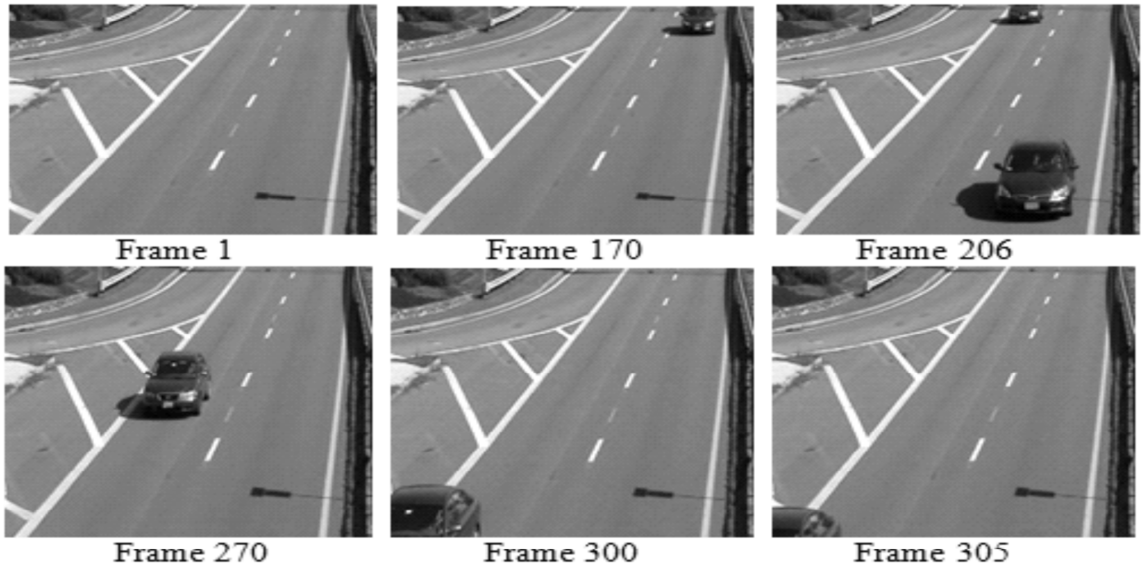

Figure 6: Frames of decoded scheme (only Model)

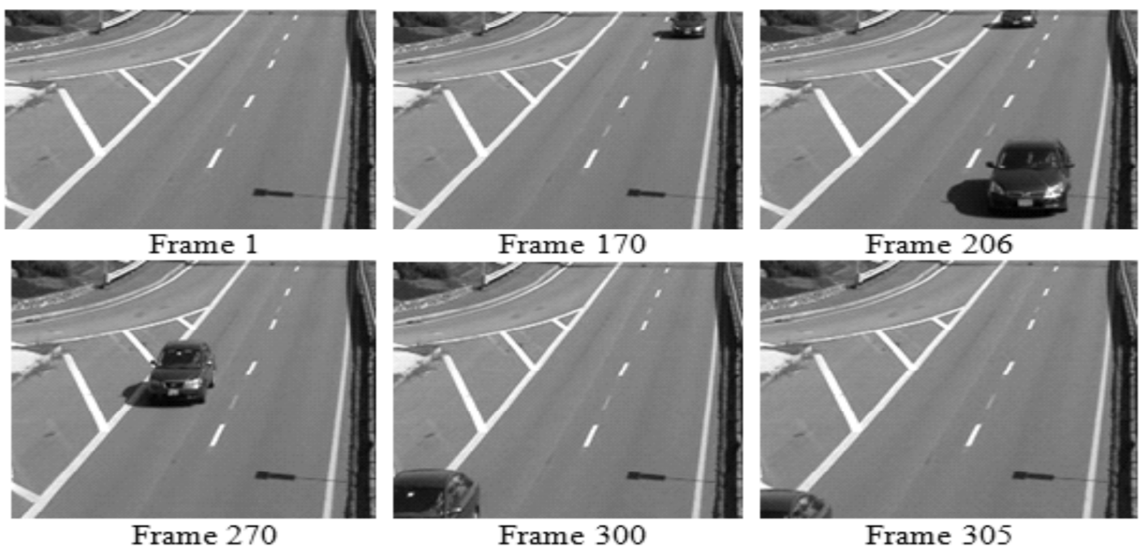

Figure 7: Full scheme Decoded Frames

The analysis of the approach is carried out by obtaining the outcomes of bit rate, PSNR and execution time. The proposed performance is compared with existing model only scheme [1]. Table 1 shows the existing and proposed bit rate savings and Table.2 shows the comparison between existing and proposed PSNR Ratio and Execution Time. As well as, the input frames are shown in Fig.4 and the frames after redundancy removal is shown in Fig.5. After the process of similarity measure the frames are encoded as per model is shown in Fig.6 and fully processed decoded frames are in Fig.7. According to the analysis the improvement of the proposed approach than the existing is clearly shown with the comparison and the simulation results.

V. CONCLUSION

In this paper, the efficiency of global redundancy removal and the reduction of space and time are carried out by implementing the proposed approach RR-ERLC. The improvement of bit rate and efficient access of video coding was illustrated by simulating the method. The analyses of the proposed approach performance have been improved than the existing such as execution time, space of storage and the redundancy removal.

As well as the results are obtained for huge datasets. Future work will deal with the redundancy and the similarity detection model which can be extended with the noise removal for efficient transmission and communication process.

REFERENCES

[1] Xiao, J., Liao, L., Hu, J., Chen, Y., & Hu, R. (2015), Exploiting global redundancy in big surveillance video data for efficient coding. *Cluster Computing*, *18*(2), 531-540.

[2] Amritha, K. M., & Nithin, S. S. Adaptive Encoding & Decoding of Compressed Video Using SPIHT Algorithm. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 4 Issue 5 2409-2412.

[3] Kamisli, F. (2015), Block-based spatial prediction and transforms based on 2D Markov processes for image and video compression. IEEE Transactions on Image Processing, 24(4), 1247-1260.

[4] Ma, M., Hu, R., Chen, S., Xiao, J., Wang, Z., & Qu, S. (2015, September). Global Object Representation of Scene Surveillance Video Based on Model and Feature Parameters. In Pacific Rim Conference on Multimedia (pp. 223-232). Springer International Publishing.

[5] Hwang, Y. T., Lyu, M. W., & Lin, C. C. (2015), A Low-Complexity Embedded Compression Codec Design With Rate Control for High-Definition Video. IEEE Transactions on Circuits and Systems for Video Technology, 25(4), 674-687.

[6] Chen, D., Li, X., Cui, D., Wang, L., & Lu, D. (2014), Global synchronization measurement of multivariate neural signals with massively parallel nonlinear interdependence analysis. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 22(1), 33-43.

[7] Chen, D., Li, X., Wang, L., Khan, S. U., Wang, J., Zeng, K., & Cai, C. (2015), Fast and scalable multi-way analysis of massive neural data. IEEE Transactions on Computers, 64(3), 707-719.

[8] Chen, D., Wang, L., Zomaya, A. Y., Dou, M., Chen, J., Deng, Z., & Hariri, S. (2015), Parallel simulation of complex evacuation scenarios with adaptive agent models. IEEE Transactions on Parallel and Distributed Systems, 26(3), 847-857.

[9] Ma, Y., Wang, L., Zomaya, A. Y., Chen, D., & Ranjan, R. (2014), Task-tree based large-scale mosaicking for massive remote sensed imageries with dynamic dag scheduling. IEEE Transactions on Parallel and Distributed Systems, 25(8), 2126-2137.

[10] Usha, M. (2014), Motion Detection in Compressed Video Using Macroblock Classification. Advanced Computing, 5(2/3), 1.

[11] Wang, L., Ma, Y., Zomaya, A. Y., Ranjan, R., & Chen, D. (2015), A parallel file system with application-aware data layout policies for massive remote sensing image processing in digital earth. IEEE Transactions on Parallel and Distributed Systems, 26(6), 1497-1508.

[12] Xu, M., Li, S., Lu, J., & Zhu, W. (2014). Compressibility constrained sparse representation with learnt dictionary for low bit-rate image compression. IEEE Transactions on Circuits and Systems for Video Technology, 24(10), 1743-1757.

[13] Zhang, X., Huang, T., Tian, Y., & Gao, W. (2014). Background-modeling-based adaptive prediction for surveillance video coding. IEEE Transactions on Image Processing, 23(2), 769-784.

[14] Bennet, M. A., Nithyadevi, R., Reglend, I. J., & Nagarajan, C. Performance and Analysis of Video Compression Using Block Based Singular Value Decomposition Algorithm. International Journal of Modern Engineering Research (IJMER), Vol. 3, Issue. 3, May.-June. 2013 pp. 1482-1486.

[15] Chen, C., Cai, J., Lin, W., & Shi, G. (2012, October). Surveillance video coding via low-rank and sparse decomposition. In Proceedings of the 20th ACM international conference on Multimedia (pp. 713-716). ACM.