CHAPTER -6

CONCLUSION

6.1 Conclusion

The research presented in this thesis focused on diverse coding techniques specific to surveillance videos. The foremost aim of this work was to propose such approaches to improve the storage capacity and bandwidth utilisation with less computational complexity. The proposed coding techniques to improve compression and processing efficiency have been described to improve on the conventional techniques. These techniques are developed under the motives laid down in Chapter 1. Most of the work has been tested and evaluated on a set of typical surveillance videos.

In the previous chapters, the basic techniques for video coding in the state-of-the art video coders have been presented. The object-based coding approach in MPEG-4 has been explained. After the background study of state-of-the art approaches, the achievements in developing the surveillance centric coding techniques can be summarised as below.

1. A technique to improve on the compression efficiency for surveillance videos has been presented. The architecture of the scalable video coding has been modified to become surveillance centric coding. The modified architecture offers a better byte saving performance. The architectural modifications in the SVC help to deal each GOP of the video with different coding parameters. This approach shows that the application of scalable video coding with an event driven approach improves the transmission and storage efficiency.

2. After introducing the SCC architecture, a novel approach to implementing foreground based SCC has been proposed. The foreground pixels are selected by using the bounding boxes of the VCA modules. This approach has the benefit of being free from shape coding and background coding as compared to MPEG-4 object based coding. In addition to this, scalable video codec can be used to exploit the scalability features as described in the SCC.

3. Different experimental results showed that the motion compensated temporal filter (MCTF) with higher levels of filtering helps to remove the temporal redundancies present in the surveillance videos. This approach has better RD performance than the block-based coding approaches, H.264.

4. A search technique with higher processing efficiency with a visual quality equivalent to the full search approach and selective search strategy specific to surveillance videos is presented. Two approaches to perform selective motion estimation, GOP based and Frame based, are described where Frame based approach performed better. The visual quality for both the approaches is the same as that of the full search.

5. To improve the selective motion estimation further, a selective block search technique has been proposed. The selection of the block is based on the novel approach where a motion detection module is used to provide the location of candidate blocks. Although, this approach performs a fewer number of block matching steps yet the overall processing efficiency of the system is close to a Frame based selective search. This is because of the overhead complexity added by the bounding box matching algorithm to locate the candidate block in the SCC.

6. After introducing selective motion estimation approaches, another novel approach, tracker-based motion estimation has been proposed where surveillance video object motion tracker information is used to calculate the motion vectors. A unique motion track is calculated for each object of the surveillance video. The distance representing the displacement of the object between the current and the reference frame is taken as a value to calculate motion vectors after identifying and matching the track in the two frames. This approach performs a faster calculation of the motion vectors but it degrades the visual quality of the video depending on the nature of the movement represented by the foreground object.

7. Finally, under the same motivation of achieving processing efficiency without loss in visual quality, fast full search approaches are explored. A fast search approach for multiple reference frames specific to surveillance videos has been proposed. This approach is based on considering different points between the two consecutive reference frames and then using these different points to avoid unnecessary block matching steps. This search approach is specific to surveillance videos with motion estimation based on multiple reference frames.

8. To improve the processing efficiency of the SCC, a multi-pattern search approach is proposed. This approach improves the processing efficiency with some loss in visual quality compared to the full search technique. However, it maintains comparable visual quality with respect to other fast search techniques for example the diamond search.

6.2. Key Contribution

This thesis presents various types of videos compression methods. There are basically two types of compression methods. One is Lossless Compression and other is Lossy Compression method. Comparing the performance of compression methods is difficult unless identical data sets and performance measures are used. Some methods perform well for certain classes of data and poorly for other classes of data. The PCA Neural Network approach provides new ways of generating codebook based on statistical feature of PCA. By combining lossy and lossless methods new hybrid semi lossy or semi lossless methods can be created.

Video compression basically means reducing frames data in videos. The existing video compression algorithms target to reduce colour nuances within the image/frame, reduce the colour resolution with respect to the prevailing light intensity and remove small/invisible parts of the picture. Of course, they can achieve good compression ratio. However, these compression techniques are totally inadequate for large-scale videos, particularly used for

medical images, military operations and CCTV recordings. In this thesis, it is furhter analysed the exiting video compression downsides and proposed a novel video compression prototype for compressing large-scale videos, which uses content mining -one of the data mining techniques. The Proof-of-Concept (PoC) application is developed using Java on Linux platform and tested with medical video processing. The results are interpreted and identified the proposed techniques compress the video at least five times more than the exiting standard video compression techniques.

For security and surveillance, image compression is primarily used for storage and real-time transmission. As technology progresses, the market is demanding higher frame-rates as well as higher resolution video, primarily intended for transmission over LANs and relatively high-speed WANs. JPEG and M-JPEG is suitable for the lower frame-rates, and wavelet is fine for high-bandwidth yet high-compression situations where the video needs to appear smooth but in fact much of the detail has been lost. MPEG-2 offers the best video money can buy but the MPEG-4 compression algorithm still offers the best video quality for the most common networks available today. After the interpretation of the implementation and analysis of the result of the proposed solution for compression surveillance and clinical medicine videos, it is found that the proposed algorithm result in better compression ratio compared to the existing video compression techniques as discussed in Literature Review Section. The compression ratio achieved is five times better than the current available compression techniques especially for CCTV and medical video compression.

As most of the surveillance cameras are expected to run 24/7, there'll be a huge amount of video data that needs to be recorded. The obvious question is how to handle the storage of the data. Uncompressed video of course gives the best possible quality. However, when it comes

to CCTV video, content rather than quality takes preference. Nobody wants to sacrifice a sizeable amount of disk space for the sake of visual quality. H.264 is the latest and most widely used video recording standard, it is used not only in CCTV systems but also in all areas of digital recording. It provides you with better picture quality compared with older standards and it provides smaller file size compared with older compressing methods. In this paper, a novel video compression technique for compressing surveillance videos is given and the obtained results are critically analyzed.

An efficient video compression approach based on frames difference approaches are developed that concentrated on the calculation of frame near distance. Many factors are applied in the selection of meaningful frames, in which it eliminates the similar frames. The implemented system passes through many steps; preprocessing, frame extraction, frame selection, frame reordering, 2DDWT, then video construction. Different types of videos are introduced to test the system. The output compressed video is in a good quality and good performance as well as it has a specific compression ratio.