Data Partition Based Error Resilience Technique in Multiview Video Communication

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Abstract. In recent years, there is increasing realization of the importance of Multiview video (3D) video transmission over wireless technology. However, a major problem with in the wireless environment is unexpected setback due to circumstances of persistent noise. Burst error from noisy environment severely affects transmission of most capable 3D video communications systems. This paper, present a compressed multi view video bitstream data partitioned according to the coding priority. These enable selective dropping in a crowded channel and prioritised wireless transmission. After an interruption, the data stream is restored to its previous strength using H.264/Advanced Video Coding (AVC). Three separate packets make up the multi-view video stream after the algorithm divides it. Data from macroblocks (MBs) that were intra-coded and added for non-periodic intra-refresh was used in the data partition that contained intra-coded residuals. Compression at low bit rates inevitably leads to quality loss owing to mistakes, according to the simulation results. However, when evaluated in terms of the quality of the reconstructed video sequence, the performance of video coding methods was shown to have been enhanced by 10%. At the same time, 3D video transmission are also increasingly reliant on networks and networked imperilment are taken seriously at software. Also, there was a record of 7 dB improvement in Peak Signal-to-Noise Ratio (PSNR). The new method of data partitioning compression support ultra-high definition 4K video streaming and used around 50% of the bandwidth currently needed.

Keywords: Error Resilience, 3D video, Data Partitioning, Wireless Communication.

1 Introduction

The essence of error resilience is the ability to make a received signal become strong again after something bad happens in the atmosphere. [1] In a 3D video communication system, the multi-view video signal in bitstream propagating in the atmosphere are severely affected by noise, as compression video at low bit rates are vulnerable and suspectable to interference. This results in the inevitable quality degradation of the reconstructed video. The viewer at the receiving end feels terrified of the poor quality so the need to design a system to be resilient to noise setbacks. The error resilience performance of video coding algorithms must be strengthened to be able to recover from setbacks that happen along the path. These can be achieved in two ways. First, is the processing of the content for transmission purposes [2]. This involves various media compression processes using various techniques such as intra-refresh (macroblock cyclic, random and adaptive systems). Others are, data partitioning, Flexible macroblock ordering (FMO), redundant picture slices etc [3]. The H.264/AVC (Advanced Video Coding) have been in use to generate compressed bitstream which is radiated through various mediums. The second

IMDC-IST 2023, October 25-27, Yola, Nigeria

DOI 10.4108/eai.25-10-2023.2348704

concern is the best way to transmit these bitstreams across the wide variety of network protocols that are in use or might be used in the future.

Nowadays, mobile multimedia communication systems are commonly used due to advancements in telecommunication industries. Movies streaming firm Netflix currently requests customers of its 4K High-Definition (HD) facility to have stable 25Mbps broadband connections, with study of data partitioning video crick shows between 12 and 16 Mbps is met. Multimedia communication systems are supported to provide efficient and cost-effective 3D video content. Figure 1 shows a basic multimedia communication system [4 -6]. The figure permits HD video to be flooded to portable headsets by by means of a lesser quantity of bandwidth than that presently desired to show tune.

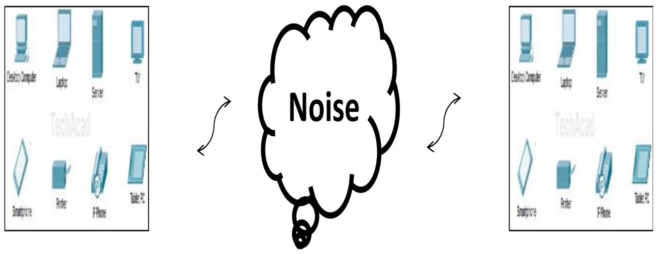

Fig. 1. Basic Multimedia Communication System.

2 Concept of data partition in H.264/AVC

Naturally, the idea of information partition in H.264/AVC is as old as video compression. It has been from the beginning when rare numerical video gestures are very big in magnitude, this makes compression inevitable. The importance of Data partition as an error resilience technique cannot be underestimated. It is the mother of all compression techniques [7]. It resolve social network customers portion video as simply as conveyance communications, and take standard-definition video to lots of equipments. Compression techniques were for guidance on the most suitable method. Information partitioning generates additional than one-bit sequence in every share, and rear-range all signs of a share into a distinct panel that has a near semantic association to each other.

There are times when transmitting or storing 3D video signals from multiple cameras can be highly complex and challenging. For 3D digital video, video compression techniques are consequently critical enabling technologies. The H.264/AVC standard is extended by MVV compression, which uses its compression methods. It is anticipated that H.264/AVC solutions can be exported into Multiview Video Coding. A study on error resilience data partitioning for multiview video coding (MVC) is presented in this work.

Bit depth, bit rate, and sample rate are all aspects of digital audio and video. Typically, they undergo compression to minimize file size and improve network streaming performance. Lossy or lossless compression is possible. An internet connection with high speed is necessary for streaming HD video. The user would frequently experience quality drops and buffering in the absence of it. Generally speaking, HD video is 3 Mbps. About 1,500 kbps is SD [9-12].

Furthermore, the application of the fault resilience technique in MVC, which is based on the H.264/AVC algorithms, follows actual steps. In conclusion, the MBs' encoding scheme is strikingly comparable to the H.264/AVC standard [13]. This is justified by the data partitioning separates coded MBs into three different partitions within a slice based on importance. The data partition process coding tool shown in Figure 2 is designed to provide resilience to channel errors.

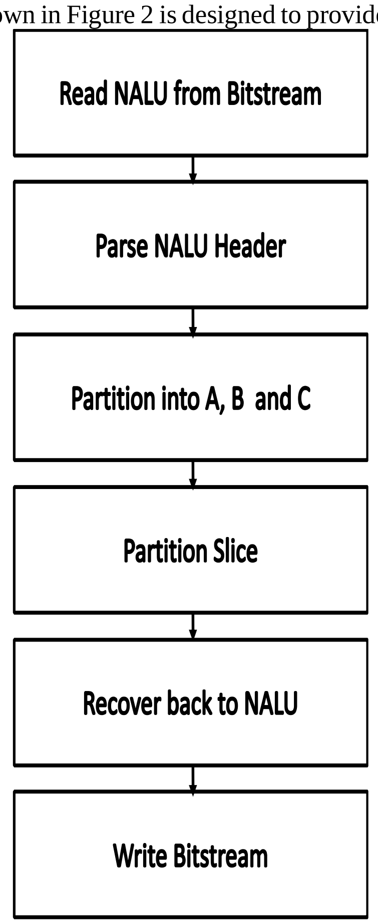

Fig. 2. Coding Process Tool.

3 Simulation procedure

The packets whose size and structure are determined by the data partitioning transport protocols must be used to radiate the coded video bit streams. These packets and the enclosed video payload are subject to significant delays and channel defects during transmission, which causes data loss and damage. In circumstances when the video decoder fails to address the consequent information loss, lost or damaged packets might have an adverse effect on the quality of the reconstructed picture. Once more, the detailed process for data partition error resilience to channel problems is shown in Figure 2. The motion vectors (MVs) are differently coded using an MV predictor's coordinates; Figure 3 shows the motion estimation procedure in a block-transform video coder's P-frame.

Inadvertently, the code searches for the start code in the bitstream and retrieves a NAL Unit first. This is due to more than just their design facilities' inability to employ a sustainable NAL unit header to identify the type. With two sequence parameter sets (SPS), one for the decoding of the primary camera and another for the remaining cameras, the system additionally increases the coding in 3D video bitstreams. Consequently, the NAL unit reads SPS and determines that its profile ID is Main Profile. It then modifies it to Extended Profile and writes it to the output bitstream while carrying out their regular tasks. Let us concentrate on NAL units of PPS or IDR kind. These are written to the output stream exactly as they are at the modest rate with anchor_pic_flag set, meaning no changes are made. The number with the anchor photo flag is not set at the end of the first NAL units, which are either CODED_SLICE or CODED_SLICE_SCALABLE in type [14]. This raises a problem for the present and future partitioning process. The role of individual partitioning, the slice header must be assessed vis a vis mass written to Data Partition A [15-18]. These tasks transcend the limit of slice consisting of an integer number of macroblocks, all the macroblock metadata. If this challenge is to be taken up seriously, it must be taken a coded coefficient for intra macroblocks that are written to Data Partition B and coded coefficients for inter macroblocks that are written to Data Partition C [19-22].

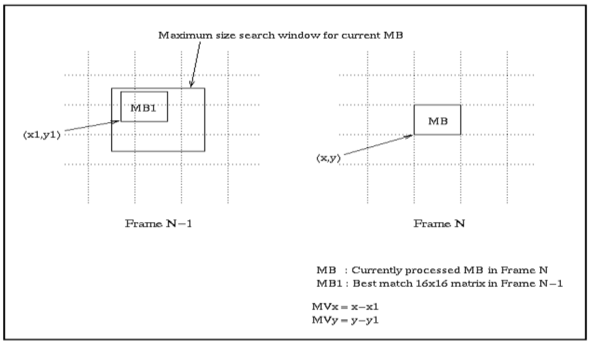

Fig. 3. Motion estimation block coders.

Data reuse inter-coded MBs are illustrated in Figure 4 as a flow diagram. As part of its network-friendly strategy, the H.264/Advanced Video Codec (AVC) offers Network Adaptation Layer units (NALUs) as a transmission container per slice.

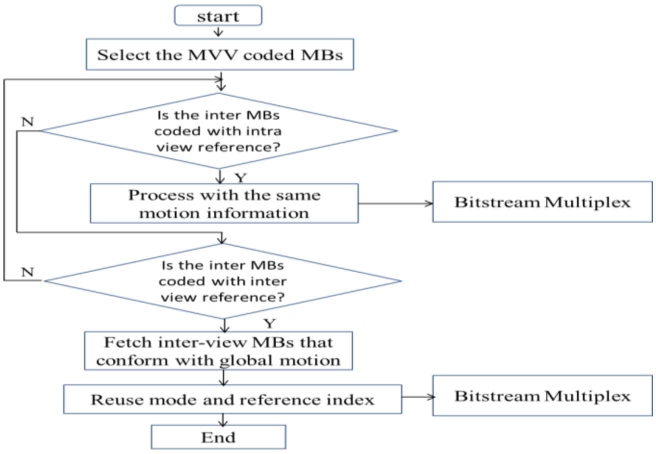

Fig. 4. Flowchart for data re-use inter-coded MBs.

4 Results

The data between the synchronization point before to the error and the point discarded at the time of the error is displayed in Figure 5. On approaching the point of data synchronization concealment, the effect of error is reduced hence the video stream between two consecutive resynchronized is divided into finer logical units. These break nosily with each logical unit containing one type of information. As soon as the DCT coefficient for the MBs in the video packet nondate partitioning syntax occurs. Error resilience structures are designed to withstand the impact of breaking quality resulting from noise mitigated. The growing dependence on intra frame in support of concealment operations network had resulted in enormous menace of quality degradation by noise. The major problem was for the decoder to locate each logical unit, this was as a result of the formidable DCT data that is free from emulation by motion data. Hence, this gives rise to effective and efficient concealment of noise operations network which also results in effective content delivery as well as a quick decision-making process by the decoder. The present-day 3D video situation constituted a complex compression operations situation that informed the need for the resilience used of data partitioning modern platforms for transmission in noisy environments.

The various measures used to represent the input bitstream and the output are shown in Table 1 and Table 2. From Table 1 it has been observed that the difference in actual bitrate of the 3 cameras was negligible this can be more clearly understood with the content of the simulation clip of the ballroom. Ballroom dance is a set of partner dances, which allows only closed dance positions. are enjoyed both socially and competitively around the world. The error resilience code contributes immensely to providing efficient motion compensation. In cognizance of these, the data partitioning created a place for an ease transition from discarding to concealing the errors.

Fig. 5. Sample output of test frame.

Table 1 shows the nomenclature of the input image bitrate and the signal-to-noise ratio. The design of the camera position to control the tremendous destructive forces of noise. The targeted bit rate is between 1777.0 - 1777.8 kbps. For mobile applications. The decoder needs to achieve this by using uninterrupted state-of-the-art error entropy coding, isolation, synchronization, and data recovery system supported with effective DCT capable of providing the required support against noise.

Table 1. Input image measurement.

Input	Bitrate (kbps)	PSNR (Kbps)
Camera 1	1777.0	43.9
Camera 2	1777.8	44.1

Camera 3	1777.6	45.0

Table 2. Output image measurement.

Input	Bitrate (kbps)	PSNR (Kbps)
Camera 1	17676.0	43.9
Camera 2	1766.8	44.1
Camera 3	17756.6	45.0

Ironically, when choosing a video coding technique for any given application, the two most crucial considerations are often bandwidth and video quality. In general, a 3D video compression strategy yields greater video quality the higher the generated bit rate. Both the total number of frames and the number of non-IDR frames affect the bitrate increase that is seen. Following data segmentation, 0.55% was discovered to be the percentage increase. As a result, the PSNR value was identical before and after the data splitting process. It follows that it is clear that the simulation's performance was predicated on the idea of an error-free system. Thus, to guarantee adequate performance, synchronization between diverse traffic streams needs to be preserved.

The minimum time delay between a frame's encoding and decoding at the receiver is necessary due to the steadily declining quality condition in real-time 3D video applications. The transnational delay generated by the codec processing and its data buffering differs from the network latency induced by extended queuing delays in terms of both volume and intensity. Video coding's enormous time delay is dependent on the material and varies according to the scene's activity level, getting longer as movement is more intense. A trade-off must be made between temporal resolution, coding delay, and picture quality in traditional systems that emphasize the use of extended coding delays, which reduce video communication quality. Time delays longer than 0.5 seconds in video communications are typically irritating and lead to issues with synchronization with other participants in the session.

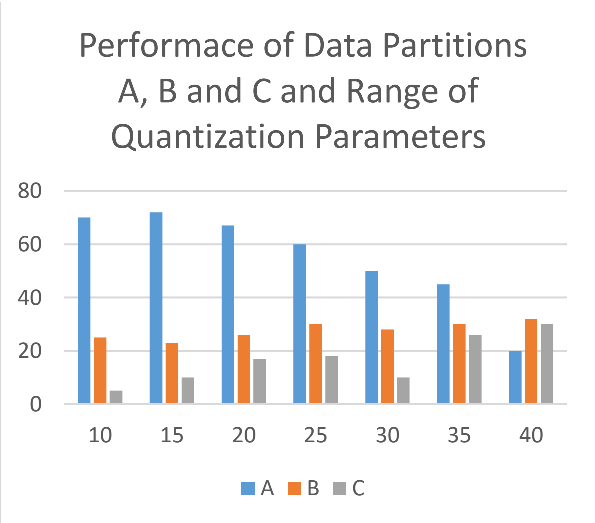

Fig. 6. Data parition performance.

The performance of data petition is shown in Figure 6. The Multi View Video Encoder settings of different MVV test sequence of Ballroom and Exit with Frame size of 640X480 at Frame rate of 25 f/s, consisting of Number of Frames per view to be 250, and Quantization parameter (QP) was carefully selected for simulation. The experiment was set to 31 whereas, an inter-coded frame was inserted every 9th frame in order to limit the temporal error propagation. The performance of the data partition A, B, and C over range of quantization parameter.

A comparison study was carried out for video quality and noise reduction capacity to further assess the algorithm's effectiveness. By adjusting the amount of noise introduced to the partitioned signal, the Signal-to-Noise Ratio (SNR) was calculated. The performance of the following processing processes should be evaluated using objective metrics in order to determine the efficacy of a certain data division method. Researchers in the field of voice encryption seldom employ the structural similarity index metrics (SSIM), but the most popular objective metrics are signal-to-noise ratios (SNR), peak signal-to-noise ratios (PSNR), mean square errors (MSE), and so on.

5 Conclusion and future work

We have effectively modeled Data Partition as an Error Resilience approach in Multiview Video Coding (MVC) in this paper. The requirement to create a framework for the smooth compression and transfer of 3D footage led to this action. The visual stream is divided into three packets by the algorithm. The simulation's findings demonstrate that low bit rate compression inevitably causes errors that lead to quality degradation. On the other hand, 10% more video coding methods performed well when evaluated in terms of the quality of the reconstructed video sequence. Simultaneously, networks are used more and more for 3D video transmission, and software developers consider networked threat seriously. The new data partitioning compression technique consumes around half of the available bandwidth and permits streaming 4K ultra-high definition video.

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