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INTERACTIVE HIGH QUALITY VIDEO STREAMING VIA COEQUAL SUPPORT VIDEO TRANSCODER

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ABSTRACT

The most challenging problem in video transcoding is to determine the spatial resolution, given a target bit rate. The spatial resolution (i.e., frame size), chronological resolution (i.e., frame rate), and amplitude (i.e., SNR) are classically excluded during the quantization step size (QS) to code the video. In video streaming, similar video is regularly requested by receivers at different sustainable receiving rates. Research works on Distortion-Quantization (D-Q) and Distortion-Rate (D-R) model was developed to enhance the source model using two-pass rate control method. D-Q and D-R model for H.264 variable bit rate coding does not provide constant video quality provided with the target rate constraint in practical video coding systems. On the other hand, the frame rate and quantization on the bit rate (QBR) provided rate constraint efficiently and effectively on both the sides of the encoder and decoder. The receiver solves the problem related to rate-constrained SVC adaptation by assuming spatial resolution with irregular perceptual video quality as output. To maintain the quality of video in a constant manner, Coequal Support Video Transcoding (CSVT) technique is developed. Coequal Support Video Transcoding enables effective transcoding in overlay streaming with constant video quality. First, CSVT leverages active co-equal cooperation without demanding infrastructure support such as a transcoding server. Second, as transcoding is computationally extreme with different types of devices used by participating nodes with minimal computing power and related resources such as bandwidth, an additional overlay called Meta-Video transcoding approach is also constructed in CSVT. The Meta-Video transcoding approach in CSVT instantly share the intermediate transcoding to minimize the total computing overhead .Experimental results collected within a realistically simulated test bed measures the factors such as video quality, PSNR rate, CPU overhead, processing time, bit rate and transmission cost.

Keywords: *Video Transcoding, Infrastructure Support, Frame Rate, Quantization on Bit Rate, Overlay Streaming, Distortion-Quantization, Metadata Overlay*

1. INTRODUCTION

With the advancement in video coding and communication technologies, the applications related to video streaming have become more and more popular in consumer electronics devices. Generally, there are two types of video streaming applications such as real-time video streaming and non real-time video streaming. In applications related to real-time video streaming, video sequences are prearranged on the spot and streamed immediately. From the coding point of view, real-time video streaming necessitates single pass video encoding.

The rate model as illustrated in [2] coded using both scalable and non-scalable encoders, over a diversity of encoder settings. Linear rate model and a linear rate control scheme for H.264 video coding as developed in [13] is a most favorable statistical multiplexing system to distribute bits transversely so that the overall video broadcast quality is maximized. The quality model is suitable only for scalable video, even though it is predictable to be appropriate for single-layer video as well. But the rate at which the adaptation of model parameters to be applied in sliding window approach based on scene change was not proven to be effective.

On the other hand, the Quota Aware Video Adaptation (QAVA) as shown in [18] managed tradeoff by leveraging the compressibility of videos and by predicting consumer usage performance throughout a billing

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cycle. QAVA addressed the timescale problem for the selection of video bit rate but was placed on limited capacity servers.

Redundant representation of I-, P-, and "merge" frames, where each original picture was encoded into multiple account, suitably with predictable transmission facilitate view switching. Multi view representations as shown in [4] lie between the two extremes did not handled the light field streaming using optimization. Reliable and Efficient Multicast Protocol (REMP) enhanced the reliability and efficiency of multicast services as described in IEEE 802.11nWLAN [8]. On the one hand, REMP enabled selective retransmissions for erroneous multicast frames and competent modification of the modulation coding scheme (MCS) but failed to implement REMP and S-REMP by modifying open-source WLAN drivers and measure the performance in real systems.

Comprehensive P-R-D framework for Wireless Video Sensors (WVS) optimization solved the problem of allocating power in [14] amongst the image sensor, compression, and transmission modules of a WVS. The optimization problem realized the optimal reconstructed video quality under power and rate constraints. To exhibit the optimization method, moreover a P-R-D model was established for an image sensor based on pixel level sigma-delta (ΣΔ) image sensor design.

For video transcoding applications, it is highly preferred that video signal be encoded in good average quality but at the same time must also ensure less quality fluctuations in the middle of adjacent frames known as variable bit rate (VBR) video encoding. Interleaved distributed transcoding in [17], a video encoding scheme allowed peer nodes to perform effective transcoding. Given a total bandnndwidth constraint, characteristically, two-pass encoding schemes were employed to accomplish smooth video quality. However, for real-time video steaming applications, it was impossible to pre-encode a video sequence. `Thus global statistical information for the complete video sequence was not available with the current implementation methods.

With the increased network bandwidth and the improved quality-of-service (QoS) support, users specify the video streaming quality they want. For this type of applications, the constraint not relies with the network bandwidth but the user-specified quality. Without the bandwidth constraint, single-pass VBR video encoding turns out to be incredibly easy. VBR video encoding basically encodes each video frame with a stable distortion. However, such a VBR video encoding is not adaptable for its high peak and large variation in bit rates, which can substantially increase bandwidth requirement for the continuous playback at the client site. Thus, in order to reduce the end-to-end network resource requirements, the smoothed traffic bit rate is preferred.

A multiuser system as considered in [12] whereby different users have probably dissimilar delay QoS constraints, resource allocation rule that maximizes the video quality was derived with an instinctive interpretation. The existing service flow management messages exchanged the data between the base station (BS) and a subscriber station (SS) and made them obtainable to the video streaming application via *LO (Cross Layer Obtainable) interface. The cross layer optimization was not described in [15] as they followed bottom up approach.

Power-scalable video encoding (PSVE) strategy for energy-limited mobile terminals as depicted in [10] helped the video encoding terminal to adjust its power consumption budget efficiently so as to enhance the power-scalable capability in mobile video terminals. PSVE was not extended to joint source and channel encoding systems in wireless communication. Power–rate–distortion (PRD) scheme [7] attained optimized resource-scalable low-complexity multi view video encoding scheme but the video quality achieved was low and not based on the available resources and the minimum resource requirements.

The performance among the subscribers and the secondary buyers as a non-cooperative game in [9] discovered the optimal price and amount for both the subscribers and buyers. Based on the performance of users in the redistribution network, the evolutionarily steady ratio of mobile users was examined who made a decision to subscribe to the data plan. Spatial, temporal, and amplitude resolution (STAR) on the quality and rate in [19] used scalable video adaptation. SVC streaming with near optimal rate-quality performance made possible the deployment of SVC in realistic applications.

Spatial resolution (SR), temporal resolution (TR) and quantization step size (QS) was designed by a function in [5] with a single content-dependent parameter. The joint collision of SR, TR and QS was precisely modeled by the creation of these three functions with merely three

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parameters. SR dimension failed to develop quality and rate models, both as functions of SR, TR, and QS, another interesting direction. The quality fair delivery broadcast rate among streams was modified based on the quality of the previously encoded and buffered packets in the aggregator. Encoding rate targets as demonstrated in [6] were evaluated by the aggregator and fed back to each remote video in a distributed way. Window model in which several adjacent frames grouped as a window in [3] were considered together where the smoothness of both image excellence and buffer residence was achieved by regulating the size of the window. Regulating the size of the window was not effective in developing the smoothness of picture quality and buffer occupancy.

Multipurpose relay nodes called Mediators into numerous positions as described in [16] within the tree networks provided distinctive for multicasting and broadcasting. By utilizing the error-correction domain separation, example in mixture with selective insertion of the supplementary data was provided from parallel networks, when the corresponding content was available. Localization approach as presented in [20] with respect to annotations of human annotators. All tested approaches necessitated a considerable quantity of the sliding window to cover the object before localization take place. In contrast, human annotators tend to restrict the target structures as soon as they interconnect the imaging plane.

For each video layer, a target packet error rate (PER) was selected in such a way that a perceptual quality assurance was measured using the multi-scale structural resemblance (MS-SSIM) index. The algorithm in target PER video layer [11], selected the modulation and coding scheme with temporal and superiority layers broadcast adaptively. The superiority layer was then modified based on the channel state information (CSI) and source rates per video layer but future enhancement layer was dropped. Distortion-quantization (D-Q) and Distortion-rate (D-R) models as illustrated in [1] thoroughly presented the accurateness of the source model by comparing the calculated results with the coding data of JM 16.0. Efficient parameter estimation strategy were then developed to enhance source model in two-pass rate control method for H.264 variable bit rate coding but does not exactly provided constant video quality under the target rate constraint.

To summarize, the contributions of Coequal Support Video Transcoding (CSVT) technique includes the following (i) facilitating video transcoder overlay streaming in heterogeneous environments with constant video quality (ii) active co-equal cooperation without demanding additional infrastructure support (iii) satisfies different demands from heterogeneous participating nodes in an overlay system using the real-time transcoding at the peers (iv) with the introduction of Meta-Video transcoding approach is moreover leveraged in CSVT by sharing metadata information with minimal computing power and (v) instantly shares the intermediate result of a transcoding procedure with other transcoding nodes and finally aims to minimize the total computing overhead in the system.

With the assistance of meta-transcoding, CSVT effectively improves the streaming quality and reduces the overall CPU cycles of overloading while maintaining the constant video quality. Through extensive real-data-parameterized simulations, client-perceived streaming video quality in CSVT is significantly improved with a small amount of additional bandwidth. CSVT significantly reduce the CPU cycles of overloading for transcoding. To the best of our knowledge, this work CSVT is the first to combine transcoding and overlay streaming to produce constant maintenance of quality.

The structure of this paper is as follows. In Section 1, describe preliminary materials on variable bit rate video encoding and the diverse form of existing work with their restrictions. In Section 2, an eye view of Coequal Support Video Transcoding (CSVT) technique is presented with overall outline of video quality. Section 3 and 4 experiment settings, datasets are outlined and present results which answer a number of research questions related to video quality. Section 6 finally concludes with beneficial solution.

2. COEQUAL SUPPORT VIDEO TRANSCODER TECHNIQUE

CSVT satisfies diverse demands from heterogeneous nodes participating in an overlay system with constant video quality. This section presents in detail about the principle behind the Coequal Support Video Transcoding (CSVT) technique, which consists of two overlays. The first overlay is the base overlay, used for streaming video transmission. Followed by this is the second overlay, used to instantly share the

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metadata information. The transitional results of the video transcoding procedure efficiently minimize the total overhead. The video transcoding overhead trade a small quantity of bandwidth for a large saving on CSVT CPU cycles in the system. The architecture diagram of CSVT technique is shown in Fig 1.

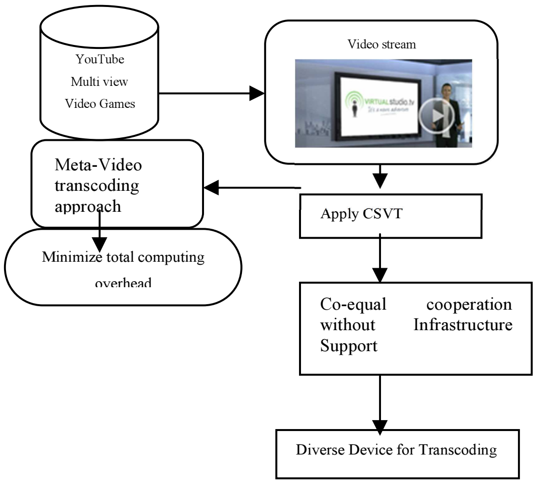

Fig 1 Overall Architecture Diagram Of CSVT Technique

As depicted in fig 1, YouTube Multi view Video Games dataset is used to obtain the constant video quality. The video stream is selected and processed using the CSVT Technique. The Co-equal cooperation without infrastructure support is maintained with different set of devices for transcoding. The CSVT technique is also combined with the Meta-Video transcoding approach to share the metadata information. As a result, the sharing of metadata information improves the quality of video with minimal computing overhead. The following subsections discusses in detail about the system model of coequal support video transcoder technique followed by meta-video transcoding approach with the help of a detailed algorithmic description.

2.1 System Model of Coequal Support Video Transcoder technique

Assume S_o be the objective average PNSR of entire video transcoding sequence. The main task in CSVT technique is to determine the number of bits Q(n) to encode the current nth frame. To smooth out the bit rate for quality maintenance, Q(n) is obtained using the arithmetic averaging filtering as,

$$Q_n = \frac{1}{L}\sum_{i=1}^{L} Q_o\,(n-1) \quad \text{............. Eqn (1)}$$

Where, L is the filter length and Q_o (n) is the corresponding bit rate when the nth frame is coded with the PSNR value of S_o. Correspondingly, the target average PSNR of the entire video sequence is achieved using the arithmetic averaging filter. In particular, the average PNSR of the entire video sequence in coequal support video transcoding is measured in terms of

$$\bar{S}[F] = \frac{1}{F}\sum_{i=1}^{F} S(n) \quad \text{..........Eqn (2)}$$

Where, F is the overall amount of encoded video frames and $S(n)$is the PSNR value of the nth frame. Assume Gaussian source with the coequal support video transcoding,

$$Q(E) = \frac{1}{2}log_2\frac{\sigma^2}{E} \quad \text{........ Eqn (3)}$$

$$Q_0(n) = \frac{1}{2}log_2\frac{\sigma^2(n)}{E_0} \quad \text{........ Eqn (4)}$$

Where, σ^2 is the picture variance and σ^2 (n) be the variance of the n-th frame, where 1<= n<=F. E_0 is the corresponding mean-squared error (MSE) for the PSNR value of S_o. To encode the video with the PSNR value of S_o , the number of bits required in CSVT technique is derived in Eqn (4). According to Eqn (1) and (4) in CSVT technique, Q(n) is expressed as

$$Q(n) = \frac{1}{2}log_2\frac{[\prod_{i=1}^{L}\sigma^2(n-i)]^{1/L}}{E_o} \quad \text{... Eqn (5)}$$

The MSE value of the nth frame is derived by combining Eqn (5) and (3) in CSVT technique,

$$E(n) = \sigma^2(n)2^{-2Q(n)} = \frac{\sigma^2(n)E_0}{[\prod_{i=1}^{L}\sigma^2(n-i)]^{1/L}} \quad \text{.....Eqn (6)}$$

From (6), the corresponding PSNR value S(n) is calculated in CSVT technique as

$$S(n) = \frac{1}{L}\sum_{i=1}^{L} log_{10}\,\sigma^2(n-i) \quad \text{... Eq (7)}$$

CSVT technique adopt the ρ-domain, where the source coding rate Q_i, the distortion D_i of frame 'i' are considered as functions of ρ_i, which is the percentage of zeros among the quantized coefficients of frame i. Specifically, the coequal support transcoding form is written as,

$$Q(\rho) = C(1-\rho) + B \quad \text{....... Eqn (8)}$$

Where, C is a constant refers to the number of bits for legend information and motion vectors. In addition, encoding video progression with a pattern of one 'i'-frame is followed by all p-frames, and the first 'i' frame is coded with a fixed quantization parameter for constant video quality on processing.

2.2 Meta-Video transcoding approach

CSVT effectively initiate the fundamentals of meta-video transcoding and video based metadata

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matrix. For bit rate computation in video transcoding, the re-quantization scale factor is stored at each instance rather than being recomputed each time when data is transcoded. In meta-video transcoding, transcoder extensively reduces CPU cycles to generate the new transcoded object. CSVT combine meta-video transcoder with overlay streaming, where a media stream is spread to a large population of clients, utilizing the forwarding capacity of the peers. CSVT meta-caching effectively balance the resources used for transcoding between the CPU cycles and the limited storage space in a transcoding server. The motivation behind the meta-caching is explained in detail with the help of a diagram as shown in Fig 2.

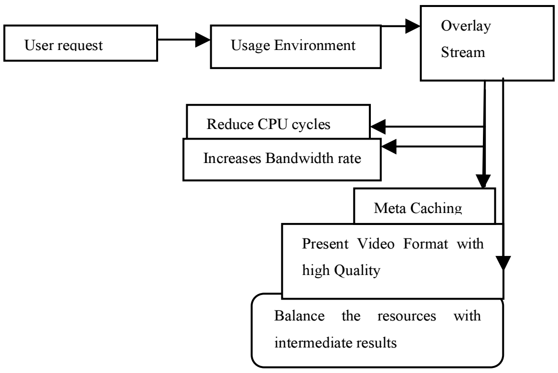

Fig 2 Meta Video Transcoding Framework

Fig 2 describes the meta-video transcoding framework where coequal support video transcoding procedure involves multiple steps. Meta-video transcoding framework includes certain transitional results, also called meta-data which is saved to avoid re-computing similar consequence again for later transcoding request. The saved metadata in CSVT consumes only a smaller storage size at the same time it only takes less computing load to generate and it is actually an effective tradeoff between the storage and CPU cycles. In addition, video instantly shares certain intermediate transcoding results with coequal support transcoding form. CSVT approach reduces the CPU overhead in the system. Clearly, additional bandwidth is attained while combing the meta-video transcoder with overlay system.

Coequal support video transcoding assume single source of video stream. In addition CSVT provide original video streaming data, the root (source of video stream) maintains a small matrix. The size of this matrix is determined by the number of possible video stream qualities. For example, if the video to be streamed has different qualities from 1 to n, then the matrix is an n*n matrix. Each element in the matrix indicates accessibility of the metadata analogous to transcoding from version i to j. By definition, the metadata matrix, denoted as n*n matrix, is an upper triangle matrix, since it is rare in practice to transcode a lower quality version to a higher quality version. Figure 3 shows an example of an n*n matrix in CSVT technique.

$$\begin{pmatrix} 0 & P_{1,2} & \text{null} & P_{1,4}\ldots.. & P_{1,j} & P_{1,n} \\ 0 & 0 & P_{2,3} & \text{null}\ldots.. & P_{2,j} & \text{null} \\ 0 & 0 & 0 & P_{3,4}\ldots.. & \text{null} & P_{3,n} \\ . & & & & & \\ . & & & & & \\ . & & & & & \\ 0 & 0 & 0 & 0\ldots\ldots & 0 & P_{n,n} \end{pmatrix}$$

*Fig 3 Example Of N*N Matrix In CSVT*

When the corresponding metadata is not available, $P_{i,j}$ in n*n matrix is null. Such metadata is obtainable and $P_{i,j}$indicate the ID in which transcoded video stream from report i to report j is included. $P_{i,j}$ also named as the meta-head and there may be other transcoding form that receives metadata from a meta-head to carry out meta-video transcoding.

2.3 Algorithmic Description of CSVT technique

In CSVT algorithm, primary P-frames of the video sequence is preset with the target PSNR rate. S_o, and the corresponding bit rate $Q_o(1)$ is correspondingly stored. The time leveling process initiates from the 2-nd P-frame. In order to encode the current frame with PSNR Q_o, the number of zeros ρ_T are first estimated corresponding to $S_o$using the linear interpolation method and then Q_o is evaluated where the α of the previous frame is used at first and then adaptively changed during the encoding. The algorithmic description of Coequal Support Video Transcoding (CSVT) technique is described as follows with frame count in the video stream.

Begin Loop

Step 1: Target PSNR initialized and consequent bit rate.

Step 2: Determine the target bit rate video form

Step 3: Perform video transcoding on the overlay stream

Step 4: Estimate Q_o (n) for the equivalent bit rate computation when the nth frame is coded with the PSNR

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Step 5: Transcoder form of meta-video confer restricted storage space in a transcoding server
Step 6: Metadata matrix constructed to convert lower video quality into higher video quality form
End Loop

In the above algorithmic step, the target number of bits for the current n[th] frame Q (n) is calculated according to Eq. (1). Note that if there is less than L, P-frames being encoded, the filter length L is changed to the number of available P-frames. In addition to the constraint of maintaining an average PSNR value, further limit the PSNR of each individual video frame within a certain range $[S_o^{min}, S_o^{max}]$ where S_o^{min}<0<S_o^{max}. The corresponding number of bits $Q_o^{min}(n), Q_o^{max}(n)$ is obtained using the same method as that for estimating Q_o in step 1.

Using the ρ-domain instruct the present frame in CSVT technique. If there is a PSNR constraint $[S_o^{min}, S_o^{max}]$ and F_m>=10, where $F_m$is the number of the coded macro blocks in the current frame, update the value of $Q_o^{min}(n), Q_o^{max}(n)$ with the new value of α. The condition of F_m>=10, 0 is selected in accordance with the ρ-domain algorithm. Q (n) is also needed to be further updating in CSVT technique. After obtaining bits $Q_o^{min}(n), and\ Q_o^{max}(n)$ the target bit rate Q (n) is further updated in order to guarantee the PSNR of the current frame lies in the desired range. After encoding the current frame, calculate Q_o (n) using the same method as that for estimating Q_o in step 1 with the actual value of α since α is known after encoding the current frame. If there is any frame left, go to step 2 otherwise stop the loop form for constant video quality maintenance.

3. PERFORMANCE RESULT OF COEQUAL SUPPORT VIDEO TRANSCODER

3.1 Experimental Setup

Coequal Support Video Transcoding (CSVT) technique is implemented in MATLAB using the YouTube Multi view Video Games Dataset. YouTube Multi view Video Games Dataset from UCI repository is a multi-variant dataset from UCI repository with integer and real attributes. The parametric factors are compared against the rate model against the quantization bit rate (QBR) model and Distortion-Quantization (D-Q) and Distortion-Rate (D-R) model. CSVT technique measures the factors such as video quality, PSNR rate, CPU overhead, processing time, bit rate and transmission cost.

YouTube Multi view Video Games dataset contains about 120k instances, each described by 13 feature types, with class information. Our work used Seismic bumps dataset for evaluation. The data describe the problem of high energy seismic bumps forecasting in a coal mine obtained from two of long walls located in a Polish coal mine. The data set consists of 2584 instances and the attributes ranges to 18 class, with a class distribution to be of "hazardous state" (class 1): 170 (6.6%) and "non-hazardous state" (class 0): 2414 (93.4%). For experimental purpose, the CSVT technique used 1000 instances with 12 attributes extracted from https://archive.ics.uci.edu/ml/machine-learning-databases/00266/seismic-bumps.arff.

Coequal Support Video Transcoding technique initial factor deals with video quality. Constant video quality in CSVT technique is a feature of a video approved during a video transmission and processing system, a proper or unofficial calculate of perceived video degradation. Video quality within the system is measured in terms of percentage (%).

PSNR rate of CSVT on overlay stream is defined as the measure the quality of reconstruction of lossy compression codec's (e.g., for image compression). The signal in this case is the original video, measured in terms of decibel (dB). CSVT CPU overhead factor is defined as the amount of video processing performed and the percentage of that capacity computed by individual computing tasks. CSVT bit rate factor is the number of bits that pass a specified point in a video stream regularly measured in terms of Kilo bits per second (Kbps). The bit rate is usually measured in some multiple of bits per second (i.e.,) thousands of bits per second named as Kbps.

Processing Time factor in CSVT technique is taken to complete a prescribed procedure where they increased output by decreasing processing time. The processing time video quality improvement is measured in terms of seconds (sec). Transmission cost factor depend on the transmission speed. The cost is the action when the transmission output is defined as point-to-point video transactions for quality maintenance with lesser cost.

3.2 Result Analysis of Coequal Support Video Transcoder

Coequal Support Video Transcoding (CSVT) technique is compared against the existing Distortion-Quantization (D-Q) and Distortion-Rate (D-R) model and Quantization Bit Rate (QBR) model. The evaluation table

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given below and graph describes the CSVT technique improvements when compared with existing system.

Table 1 Tabulation Of Video Quality

Video Frame	Video Quality (%)		
	D-Q D-R model	QBR model	CSVT technique
Frame_1	74	85	99
Frame_2	71	84	98
Frame_3	73	83	97
Frame_4	78	81	97
Frame_5	72	81	96
Frame_6	73	80	94
Frame_7	69	80	95

Table 3 describes the quality of video based on the frames. The input video cannot be used directly. They are preprocessed and divided into frames of range Frame_1 to Frame-1. The experimental result are plotted in graph and depicted in Fig 4.

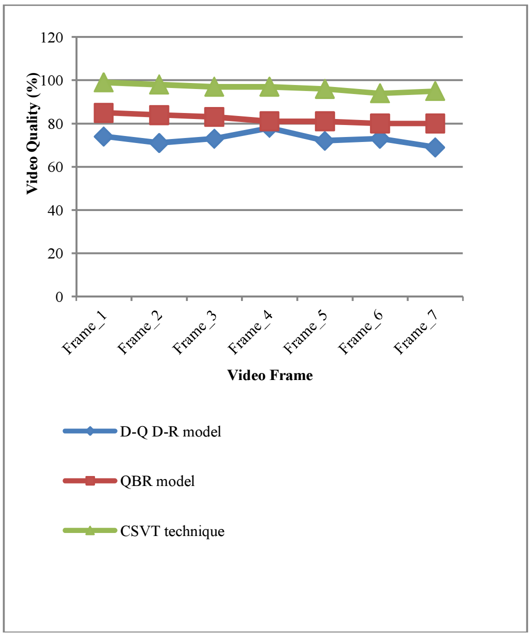

Fig 4 Video Quality Measure

Fig 4 describes the video quality based on the frames in Distortion-Quantization (D-Q) and Distortion-Rate (D-R) model [1], Quantization Bit Rate (QBR) model [2] and Coequal Support Video Transcoding (CSVT) technique. CSVT technique combines Meta-Video transcoding approach to share the metadata information and improves the quality of video from 20 – 30 % when compared with the D-Q D-R model and 14 – 16 % improved when compared with the QBR model. The quality of video is enhanced by meta-video transcoding, in which the intermediate transcoding results shares with coequal support transcoding form.

Table 2 Tabulation Of PSNR Rate

Frame Number	PSNR rate (dB)		
	D-Q D-R model	QBR model	CSVT technique
30	7.15	7.58	9.26
60	9.07	9.15	11.17
90	13.89	13.26	16.89
120	10.24	10.22	12.18
150	13.56	14.23	16.26
180	18.47	18.94	22.46
210	20.25	21.14	25.92

Table 1 describes the PSNR rate based on the frame number. As the count increases, PSNR rate improves gradually.

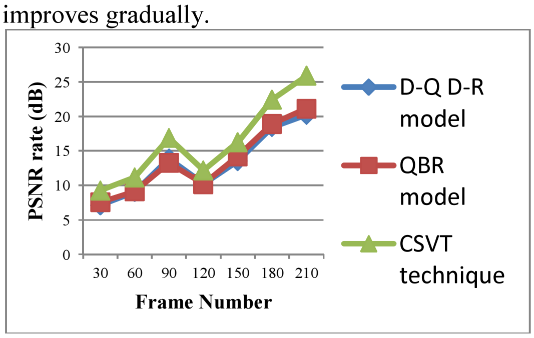

Fig 5 Psnr Rate Measure

The PNSR experimental evaluation of entire video transcoding sequence is shown in Fig 5. The main task in CSVT technique is to determine the number of bits Q(n) to encode the current n^{th} frame and improve the SNR rate. To smooth bit rate for quality maintenance, Q(n) is obtained using the arithmetic averaging filtering. When compared with D-Q D-R model [1] and QBR model [2], CSVT technique is approximately 18 – 23 % improved in PSNR rate.

Table 3 Tabulation Of CPU Overhead

Rate (bits/sample)	CPU Overhead (units)		
	D-Q D-R model	QBR model	CSVT technique
0.3	51	49	46
0.6	88	82	77
0.9	55	51	47
0.12	65	60	56
0.15	45	41	39
0.18	63	59	55
0.21	71	66	62

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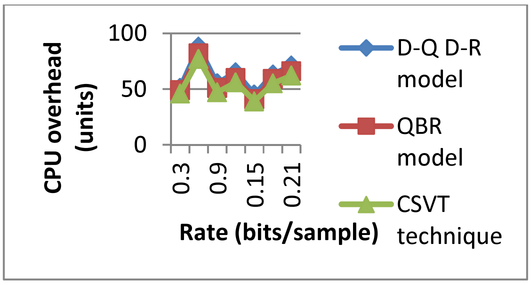

Fig 6 Measure of CPU Overhead

Table 3 and Fig 6 illustrate the CPU overhead based on the rate of bits per sample. With the bits/sample gets increased, CPU overhead is reduced in CSVT technique using the intermediate result of a transcoding procedure with other transcoding nodes. CPU overhead depends on the continuous loading of the low quality video, measured in terms of units. The intermediate result storage reduces the overhead of CPU from 5- 10 % when compared with the D-Q D-R model [1] and 10 – 15 % reduced when compared with the QBR model [2].

Table 4 Tabulation For Bit Rate

Frame Rate	Bit rate (Kbps)		
	D-Q D-R model	QBR model	CSVT technique
5	2150	2205	2500
10	2235	2355	2600
15	2250	2310	2600
20	2460	2630	2920
25	2750	2890	3265
30	2515	2645	2990
35	3015	3245	3620

The table 4 performs the measure of bit rate in Distortion-Quantization (D-Q) and Distortion-Rate (D-R) model [1], Quantization Bit Rate (QBR) model [2] and Coequal Support Video Transcoding (CSVT) technique. The bit rate of CSVT with [1,2] is measured in terms of Kilo bits per second [Kbps].

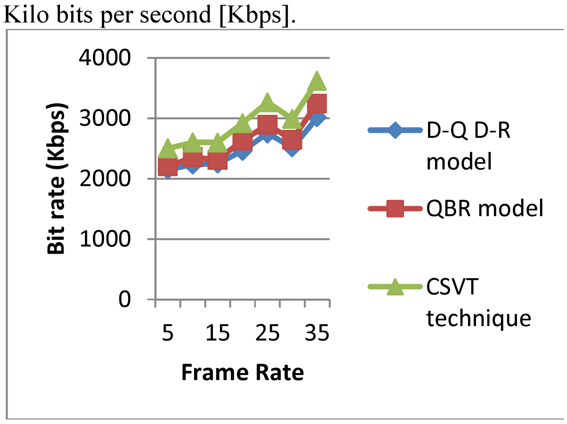

Fig 7 Bit rate Measure

Fig 7 illustrates the bit rate measure of CSVT technique and is compared against the D-Q D-R model and QRP model. target bit rate Q (n) is further updated such that $Q_o^{min}(n), and\ Q_o^{max}(n)$ guarantee the PSNR of the current frame that lies in the desired range. The condition of F_m>=10, 0 is selected in accordance with the ρ-domain algorithm to improve the bit rate from 14 – 16 % in CSVT when compare with D-Q D-R model [1] and 10 – 12 % improved when compared with the QBR model [2].

Table 5 Tabulation of Processing Time

Frame Count	Processing Time (sec)		
	D-Q D-R model	QBR model	CSVT technique
20	124	117	111
40	63	59	54
60	522	491	462
80	221	212	190
100	831	873	924
120	216	225	247
140	537	408	447

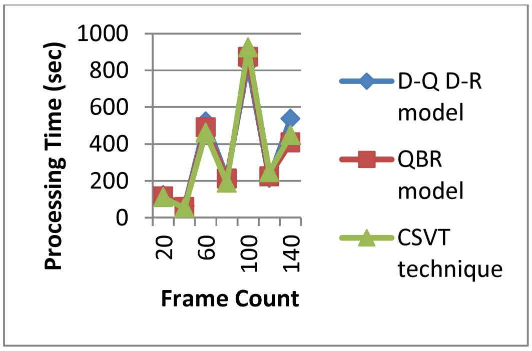

Fig 8 Measure Of Processing Time

Fig 7 illustrates the processing time of CSVT against the D-Q D-R model and QBR model. The time leveling process created from the P-frame in order to encode the current frame with PSNR Q_o for reducing the time level. Q_o first estimate the number of zeros ρ_T corresponding to $S_o$using the linear interpolation method and then compute Q_o where α of the previous frame is used during the encoding. As a result, the processing time using CSVT technique is 5 - 15 % decreased when compared with the D-Q D-R model [1] and 5 – 10 % decreased when compared with the QRP model [2].

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Table 6 Tabulation Of Transmission Cost

Storage Size (KB)	Transmission cost (ms)		
	D-Q D-R model	QBR model	CSVT technique
44	987	904	852
168	1123	1051	999
512	1521	1410	1385
769	1830	1695	1423
1420	2216	1999	1847
324	221	202	150
1328	2565	2340	2245

The transmission of CSVT video cost is measured against the D-Q D-R model and QBR model. The transmission cost is measured based on the storage size, measured in terms of Kilo Bytes (KB).

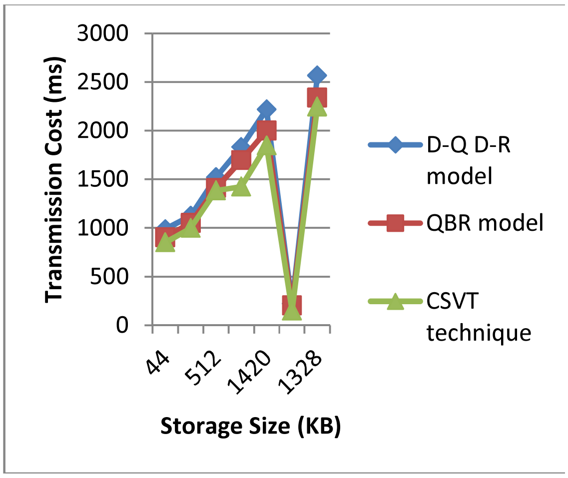

Fig 9 Measure Of Transmission Cost

Fig 6 describes the transmission cost based on storage size in D-Q D-R model, QBR model and CSVT model. The transmission cost rate is measured in terms of milliseconds (ms). The saved metadata in CSVT consumes only a small storage size while it takes a less computing load for transmitting. CSVT generate an effective tradeoff between the storage and CPU cycles by reducing the transmission cost when compared with D-Q D-R model [1] and QBR model [2]. The CSVT transmission cost is reduced to 10 – 15 % when compared with the D-Q D-R model and 2- 8 % reduced when compared with the QBR model.

As the final point of experimental evaluation, video quality maintenance is an important solution to improve the PSNR rate and bit rate. The improved PSNR rate management is based on the arithmetic averaging filtering. The experimental results shows the significant improvement of processing time, transmission cost, minimal CPU overhead for a great number of users and for big sizes of data.

4. CONCLUSION

To maintain constant video quality, Coequal Support Video Transcoding (CSVT) technique is developed that enables effective transcoding in overlay streaming. CSVT provides active co-equal cooperation without demanding additional infrastructure support. Then, as transcoding is computationally difficult with minimal computing power and interrelated maximized bandwidth resources, the concept of Meta-caching identifies intermediate transcoding steps from which positive intermediate results are accomplished. A Meta-Video transcoding approach is constructed in CSVT technique to instantly share the intermediate transcoding to minimize the computing overhead. Driven by parameters obtained from practical transcoding and meta-video transcoding schemes, the effectiveness of CSVT mechanism is presented. The experimental results of CSVT using YouTube Multi view Video Games Dataset estimate the performance of Coequal Support Video Transcoding. CSVT attains the constant video quality, PSNR rate, improved CPU overhead, lesser processing time, effective bit rate and lesser transmission cost.

REFERENCES:

[1] Jun Sun., Yizhou Duan., Jiangtao Li., Jiaying Liu., and Zongming Guo., "Rate-Distortion Analysis of Dead-Zone Plus Uniform Threshold Scalar Quantization and Its Application—Part II: Two-Pass VBR Coding for H.264/AVC," IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 22, NO. 1, JANUARY 2013

[2] Zhan Ma., Meng Xu., Yen-Fu Ou., and Yao Wang., "Modeling of Rate and Perceptual Quality of Compressed Video as Functions of Frame Rate and Quantization Step size and Its Applications," IEEE TRANSACTIONS ON. CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, 2012

[3] Long Xu., Debin Zhao., Xiangyang Ji., Lei Deng., Sam Kwong., and Wen Gao., "Window-Level Rate Control for Smooth

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Picture Quality and Smooth Buffer Occupancy," IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 20, NO. 3, MARCH 2011

[4] Gene Cheung., Antonio Ortega., and Ngai-Man Cheung., "Interactive Streaming of Stored Multiview Video Using Redundant Frame Structures," IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 20, NO. 3, MARCH 2011

[5] Yen-Fu Ou., Yuanyi Xue., Yao Wang., "Q-STAR: A Perceptual Video Quality Model Considering Impact of Spatial, Temporal, and Amplitude Resolutions." arXiv:1206.2320v1 [cs.MM] 11 Jun 2012

[6] Nesrine Changuel., Bessem Sayadi., Michel Kieffer., "Control of Multiple Remote Servers for Quality-Fair Delivery of Multimedia Contents," arXiv:1401.6361v1 [cs.MM] 24 Jan 2014

[7] Li-Wei Kang., Chun-Shien Lu., Chih-Yang Lin., "Low-complexity video coding via power–rate–distortion optimization," J. Vis. Commun. Image R., Elsevier journal,., 2012

[8] Wan-Seon Lim., Dong-Wook Kim., and Young-Joo Suh., "Design of Efficient Multicast Protocol for IEEE 802.11n WLANs and Cross-Layer Optimization for Scalable Video Streaming," IEEE TRANSACTIONS ON MOBILE COMPUTING, 2011

[9] W. Sabrina Lin., and K. J. Ray Liu., "Game-Theoretic Pricing for Video Streaming in Mobile Networks," IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 21, NO. 5, MAY 2012

[10] Wen Ji., Jiangchuan Liu., Min Chenc., Yiqiang Chena., "Power-efficient video encoding on resource-limited systems: A game-theoretic approach," Future Generation Computer Systems., Elsevier Journal., 2012

[11] Amin Abdel Khalek., Constantine Caramanis., and Robert W. Heath Jr., "Joint Source-Channel Adaptation for Perceptually Optimized Scalable Video Transmission," IEEE Global Telecommunications Conference (GLOBECOM 2011), 2011

[12] Amin Abdel Khalek., Constantine Caramanis., and Robert W. Heath Jr., "Video Quality-Maximizing Resource Allocation and Scheduling with Statistical Delay Guarantees," In Proc. of IEEE INFOCOM, 2012

[13] Zhihai He., and Dapeng Oliver Wu., "Linear Rate Control and Optimum Statistical Multiplexing for H.264 Video Broadcast," IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 10, NO. 7, NOVEMBER 2008

[14] Malisa Marijan., Wendi Heinzelman., Gaurav Sharma., and Zeljko Ignjatovic., "Optimal Resource Allocation for Wireless Video Sensors with Power-Rate-Distortion Model of Imager," IEEE 978-1-4244-4480-9/09/$25.00 ©2009

[15] Djamal-Eddine Meddour., AlaeddineAbdallah., ToufikAhmedb., RaoufBoutaba., "Cross layer architecture for multicast and unicast video transmission in mobile broad band networks," Journal of Network and Computer Applications., Elsevier journal., 2011

[16] Michael Karl.,Tatiana Polishchuky., Thorsten Herfetz., and Andrei Gurtovyx., "Mediating Multimedia Traffic With Strict Delivery Constraints," IEEE International Symposium on Multimedia (ISM), 2012

[17] Jeonghun Noh., BerndGirod., "Robust mobile video streaming in a peer-to-peer system," SignalProcessing: Image Communication., Elsevier journal., 2012

[18] Jiasi Chen., Amitabha Ghosh., Josphat Magutt., and Mung Chiang., "QAVA: Quota Aware Video Adaptation," ACM journal., 2012

[19] Hao Huz., Zhan Mayz., Yao Wangz., "OPTIMIZATION OF SPATIAL, TEMPORAL AND AMPLITUDE RESOLUTION FOR RATE-CONSTRAINED VIDEO CODING AND SCALABLE VIDEO ADAPTATION," 19th IEEE International Conference on Image Processing (ICIP), 2012

[20] R. Kwitt, N. Vasconcelosb, Razzaquec, S. Aylward., "Localizing Target Structures in Ultrasound Video, A Phantom Study," Elsevier journal, 2013.