A Survey on Smoothing Quality And The Liveness Of The Stream By Increasing The Smoothing Window Size In Video Streaming

A.Jagadeeshwaran
Research scholar, PG&Research department of computer science, Government Arts College, udumalpet.
Email: jagadeeshsamy@gmail.com
Dr.E.Karthikeyan
Assistant professor and Head, PG&Research department of computer science, Government Arts College, udumalpet.Email:
ekarthi@gmail.com

---**ABSTRACT**---
The smoothing can be performed at either the end-point source of the video cast or at special smoothing server(s) (e.g., proxies or gateways) within the network. Bandwidth smoothing techniques for stored video perform end-end work ahead transmission of frames from the video source into the destination client video playback buffer in advance of their display times, and are very effective in reducing the bursty transmission bandwidth requirements of compressed, stored video. In layered streaming the video in peer-to-peer (p2p) networks has emerging lot of interest to maintain large number of users and to handle peer heterogeneity. Nowadays there is a lack of scheduling in a layered stream of networks. In p2p networks to ensure the uniform delivery of layered streaming there is a play out smoothing mechanism. This mechanism reduces the quality changes on streams according to the changing network conditions.However reducing the quality on streams ensures the lack of good metrics in assessing the video performance and at the same time smooth delivery of layered stream. As a result the quality of experience (QoE) between the users will be degraded while there is a change in available bandwidth. In this work we propose a smoothing window mechanism to achieve the good tradeoff between the smoothing qualities and the liveness of the stream by increasing the smoothing window size.

Keywords - Layered video streaming (LVS) - Layered video coding (LVC) - p2p networks - QoE - Smoothing -– scheduling - trade-offs.

I.Introduction

Many multimedia applications, such as videocasting and video-based entertainment services [2–4], rely on the efficient transmission of live or stored video. However, even when compressed, high-quality video can consume a significant amount of network bandwidth, ranging from 1–0megabits/second. In addition, compressed video often exhibits significant burstiness on a variety of time scales, due to the frame structure of the encoding scheme and natural variations within and between scenes [5–10].

The transmission can become even more bursty when one or more video sources are combined with text, audio, and images as part of an orchestrated multimedia stream.

Previous work on bandwidth smoothing has focused on the three extremes of *interactive* and *stored, online* video. In interactive video applications, such as video teleconferencing, the sender typically has limited knowledge of frame sizes and must impose strict bounds on the delay to the client(s). As a result, smoothing for interactive video typically requires dynamic techniques that can react quickly to changes in frame sizes and the available buffer and bandwidth resources.Layered video streaming has emerged for multimedia content in p2p networks where as client heterogeneity of layered video coding handled by user and supportable for group of users.

With layered video coding the original video is partitioned into several layers (i.e.) multiple layers & transmitted independently. This mechanism allows the users to get all layers of the video with maximum quality when there is a higher capacity of peers and the lower capacity will get lower quality of video. To support layered video streaming in p2p networks we use three essential components, they are content delivery, content adaptation and overlay construction.

In content delivery the user will request and transport the content chunks. In content adaptation the user will have the ability to maintain the client heterogeneity. In overlay construction the user will retrieve the contents from appropriate neighbor. The most important challenges are fluctuation in available bandwidth between peers, when there is a sufficient bandwidth available then maximal video quality delivery is available to the user. If the bandwidth is only available for brief period, soon it will be forced to fall back to select lower quality layers which lead fluctuation in user QoE.

So we propose a new mechanism called play out smoothing mechanism, balances the aggressiveness in bandwidth and maintains stable user QoE. In non layered streaming there is no difference between high delivery ratio and high throughput because there is no inter-layer dependency. This is not in the case of layered streaming.

Two basic scenarios are covered in this under certain bandwidth conditions. First, the selection of many layers experiencing low delivery ratio for each one of them. Secondly the selection of few layers but experiencing a higher delivery ratio for each one of them.

First scenario is due to interlayer dependencies which severely degrade the system performance and wastages of resources (that we will refer as useless chunks). To ensure the effective utilization of bandwidth the scheduling algorithm is used. It provides stable QoE according to the available network capacity. For that we propose the mechanism called smoothing, that has the ability to control the level of smoothness (i.e.) layered video encoding by adding and dropping layers.

The efficiency of LVS concerned with better scheduling mechanism. The core objective of scheduling algorithm is to minimize the useless chunk ratio by introducing a priority mechanism for proper delivery of different layers. And also it provides the chunk availability in the neighborhood, urgency of chunks and dependencies between the layers. In our work we focus on the quality level fluctuations in layered streaming and also the bandwidth utilization.

Hence we propose an algorithm to select the maximum quality level based on the available bandwidth. This is done efficiently by requesting chunks from the neighbors and at the same time to maintain a satisfactory level of video smoothness. The effectiveness and optimality of LVS is lacking due to amount of delay introduced by frequency reduction component (i.e.) smoothing window size parameter.

2. RELATED WORK

There are lot of efforts in the design and evaluation of layered video streaming systems, in that the client heterogeneity has received the attention. We now present some of these works in this paper.

Many multimedia applications transmit stored video streams from a server to a client across a high-speed network. For each stream, the server retrieves data from its video storage system and transfers it onto the high-speed network according to a *transmission schedule*. The client decodes and periodically displays the data it receives from the server. Data arriving ahead of its playback time is stored in a client buffer. In order to ensure continuous playback at the client, the server must transmit the video stream in a manner that ensures that the client buffer neither underflows nor overflows.

The dimension of layered p2p video streaming problem proposed by Rejaie et al. [1] it is a receiver driven p2p video streaming system with quality adaptive playback of layered video. This system provides an adaptive mechanism from multiple senders to a single receiver, in this paper the smoothing problem didn't to be considered. Another example is focused on benefits of network coding with layered streaming [2]. This work focuses on the average quality satisfaction of the peer, but doesn't consider the degradation in user's quality of experience (QoE). Another proposed mechanism by Fernandes et al. [3] for scalable streaming of stored video over the networks with feedback notification. In this the possibility of smoothing the information received from the transport layer before making the decision concerned with the sending rate. Here the authors provide mismatch between the available bandwidth variability and encoded video rate variability.

Another work done by author Hu H [4], proposed taxation –based p2p layered streaming design with the mesh topology adaptation and layer subscription strategies. This work focuses for layer selection and quality in p2p systems. Another work by Nguyen [5], et al. focuses on the neighbor selection in layered streaming and identifies the unique challenges of neighbor selection for system performance and the techniques that offer good performance and scalability under network fluctuations. Our work focuses selecting the appropriate layers according to available local resources to ensure smoothing

The chunk scheduling of p2p networks works based on specific algorithms like Local Rarest First (LRF) [6] and Round robin (RR) [7]. Apart from empirical studies, some works use queuing models for scheduling [8]. The algorithm proposed in [9] minimizes the base layer losses but it assumes equal rates for the enhancement layers. Further a few theoretical studies tackle the optimal stream scheduling. In [10] a scheduler has been proposed to maximize the video quality by prioritizing the most important chunks. This strategy is called as push-based, tree-structured overlays. The scheduling mechanism proposed in layer p2p2 [11] is able to save base layer losses to the damage of the enhancement layers. Here the chunks request is into the two types: regular requests and probing requests.

Wang and zheng [12] propose an optimal scheduling strategy to minimize the overall video distortion, but it is strongly related to the multiple descriptions coding which is less efficient with layered coding. And also zhang [13] have discussed the scheduling problem in data driven streaming systems. They define the utility for each chunk as a function of its rarity, which is the number of potential senders of this chunk and its urgency, which is the time difference between the current time and deadline of the chunks. And finally they transformed the chunk scheduling problem into min-cost flow problem and it is not feasible for the live video streaming systems

In [14] the author also addresses the chunk selection problem in streaming layered video content over peer-to-peer networks. There are number of theoretical solutions to maximize the utility function of chunks but the proposed chunk utility functions may difficult in real life scenarios.

3.PROBLEM STATEMENTS

The main problem in assessing the performance of a video delivery scheme is the lack of a good metric of the user's perception of video quality. It is generally observed that it is very tedious to watch a video with consistent, lower quality than one with higher but varying quality [15]. However, reducing the quality to bare minimum by following a strictly conservative approach is undesirable, as it fails to adequately take advantage of available overlay resources.

The objective of the layer selection mechanism is to optimize the perceived video quality, and also at the same time ensuring the smooth delivery of the layered stream. To explain our smoothness criterion, which exemplifies two possible approaches to stream smoothing for a given available bandwidth profile. In amplitude reduction [16] raw stream attempts to precisely track the changing available bandwidth. As a result, the QoE of the user may be severely degraded, especially when there is a drop from a high quality level to a much lower one.

In comparison, the smoothed stream by amplitude reduction reduces the size of the jump from higher to lower quality level. The objective here is to ensure a gradual change in quality levels, rather than subjecting the user to widely varying QoE. This technique is referred to as amplitude reduction. The alternative technique which aims to reduce the number of changes in quality level due to variations in available bandwidth is called the frequency reduction

The play out smoothing mechanism has two additional factors. Firstly, the smoothing mechanism sacrificing higher quality to achieve long term smoothness and sacrificing better smoothness to better take advantage of short-term available bandwidth. Secondly, the smoothing mechanism is taken into the consideration that the extra delay for the user may experience as a side-effect of the smoothing algorithm. This extra-delay may affect the liveness of the stream, thus making it unsuitable for live streaming applications. Thus, a playback smoothing mechanism [17] should apply both amplitude and frequency reduction to achieve a good tradeoff between user QoE and bandwidth efficiency while incurring low processing delay. Once the playout smoothing mechanism has selected a target quality level, the next step for the algorithm is to decide the order in which the chunks of the selected layers are requested, and from which neighbor peers.

This is to be made that all higher layer chunks available in the decoding buffer can be decoded before their playback deadline expires. If, for any reason a higher layer chunk is acquired and is not decoded on time, then there is the wastage of resources and it is to be considered a useless chunk. And also the playout smoothing mechanism must also utilize available system resources efficiently.

The sliding window mechanism consists of different layer chunks. For scheduling mechanism the author uses mesh-based pull approach in which the receiver side buffer is organized into sliding window. The chunks beyond the playhead position are denoted as exchanging window. So each peer informs the chunk that holds to all its neighbors by sending the buffer map.

In buffer map the three types of chunk remain to follow the playhead position until the missed chunks of peer's remains in exchanging window and also the chunks are re-requested if not received.

4.SCHEDULING FOR SMOOTH LAYERED STREAMING

Chunks are basic unit of data exchange in the networks. The chunk carries information of video segment to the layer. The receiver peer request the content from the neighbor peers as per the proposed playout smoothing mechanism. Where the smoothing mechanism can be done in two ways. First one is for pre-recorded video where the initial quality smoothing can be done there and another mechanism is to handle the run time quality smoothing.

1. Smoothing function

The smoothing function's core objective is to select which layer is to be requested during the next time period in order to increase the overall QoE while there is an variability in bandwidth. In order to use the smoothing algorithm regarding video chunks the receiver side exchanging window divides the window into three intervals namely playing buffer, urgent buffer and prefetching buffer

The main goal of the scheduling function is to efficiently request the missing chunks in the exchanging window of the receiver peer. This can be achieved by requesting the higher priority chunks before the lower priority chunks while at the same time taking full advantage of the available network capacity. In frequency reduction mechanism we had two smoothing window and a prefetching buffer, that is we use emergency priority and layer priority. The priority of chunk scheduling is done through aggressive and conservative chunk scheduling. The existing Harmony search algorithm is able to processed data in scheduling period is very low and exchanging window size is also very low and only the minimum that is only 30 neighbors can proceed at a time.

5.CONCLUSION

In this paper we propose the smoothing window mechanism for LVS in p2p network that selects according to the bandwidth utilization for both amplitude and frequency reduction in layered streaming

This paper proposes the effectiveness on layered video coding on useless layers when there is sudden decrease in bandwidth and also the optimality and effectiveness of prioritization of chunks in scheduling.

And finally we propose to increase the scheduling of harmony search algorithm and to increase the exchanging window size and to increase the neighbors at maximum level. So that we can able to increase the smoothing quality between the user and maintain QoE in the live video stream.

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