Multi-level Supportive Live Media Streaming with VBR in Mobile Environments

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Abstract—Video streaming over mobile Environments is compelling for many applications, ranging from news and multimedia messaging services for cell phones, extended broadband Internet access in corporate or community networks, to wireless home entertainment or surveillance camera networks, audiovisual communication in search-and-rescue operations. In spite of the growing networking capabilities of modern wireless devices and the sophisticated techniques used by todays video coding and streaming systems, video streaming over wireless networks remains a challenging task. The wireless radio channel is subject to interference from other nearby transmitters, causing fluctuations in link capacities and sometimes an error prone communication environment. Due to variations of content and dynamic user behavior the mashed video streams traffic patterns typically change over time, and the received video quality may degrade drastically in the presence of packet losses, due to error propagation in the mashed bit stream. So, in this paper we propose multi-level cooperative for effective data streaming management techniques like VBR, dynamic headlight prefetching, multi-user resource allocation and mashed video sense chaining. Benefits of multi-level cooperative media streaming with VBR are to increase the QoS for Live video Streaming.

Keywords—VBR, Multi-hop, Head-Light Prefetching, Mashed Sensing, Sensor Network, Video Mashing.

I. INTRODUCTION

In live media streaming, the bit rate are used in the sound or video encoding, and the term variable bit rate (VBR) that relates the bit rate are used in telecommunications and computing fields. For the segment per time, there will be the change in the capacity of output data for variable bit rate files when compared to constant bit rate (CBR) [1]. For the more complex segments of media files, the storage space will be more, and for less complex segments the less space is allocated and therefore VBR permits a higher bit rate [2]. An average bit rate for the file can be produced and it will be calculated by the average of these rates.

For the past years, many hardware and software players are not able to decode the variable bit rate files properly because the using VBR encoders were not well developed. For the interest of compatibility, because of this result there will be the common use of CBR over VBR. In the huge majority VBR encoded files are supported by the modern portable music devices and software and in the year of 2006 December the largely disused files are CBR encoded files that are supported by devices [3]. In most digital audio players released by the companies like SanDisk, Creative Technology, Apple and Microsoft supports for VBR in AAC and MP3 files is founded [4]. In some cases like audio books and acoustic music, when encoding monotone or minimal tones an audible artifacts were introduced occasionally in early VBR algorithms [5]. During the silence portions of the song or when there was only speaking, a “digital chirp” is mimed by these artifacts. Later generation of the VBR standard, these problems have been settled by improving the VBR encoding algorithms.

Media streaming in mobile environments has been attracting much attention lately. A real-time continuous media streaming protocol with special emphasis on dynamic transmission capacity allocation and pre-fetching is proposed [6]. Nonstop middleware with partition prediction and service replication for continuous media streaming in mobile and ad hoc networks is developed. Video streaming techniques in 3G mobile networks on top of three-tier architecture is implemented [7] [11]. These are only focused on the coordination of media servers for smooth handover and the rate adaptation technique when a base station becomes overloaded. There is no coordination at the base station level or the user level. Data management issues, pre-fetching in particular, are largely ignored [8]. Group mobility to predict the future availability of wireless links for increasing total streaming capacity is proposed [9]. An iterative algorithm to predict continuous link availability between mobile users is proposed. The V3 architecture proposed for live video streaming is essentially a cooperative streaming architecture for moving vehicles. And belongs to our proposed levels, we overcome the propagation delay this is our major contribution of this work. The AO2P algorithm proposed for privacy routing uses a mechanism such that a receiver geographically closer to the destination is assigned to a class with a higher priority for contending the channel to be the next hop [10]. The routing request in AO2P is sent to all neighboring nodes.

The work on moving objects databases is needed to maintain dynamic data items. For representing and processing dynamic attributes such as locations and trajectories, spatial and temporal indexing methods are devised [12]. The headlight pre-fetching is proposed for media streaming in mobile environments [13]. It has headlight pre-fetching zone
that is a virtual fan-shaped area along the direction of user movement similar to the headlight of a vehicle. All service access pointers (SAP) of the cells that overlapped with the zone are selected as the prefetching SAPs.

II. BIT RATE

In telecommunications and computing, bit rate is the number of bits that are conveyed or processed per unit of time.

A. Variable Bit Rate (VBR)

Is a term used in telecommunications and computing, that relates to the bit rate used in sound or video encoding. As opposed to constant bit rate (CBR), VBR files vary the amount of output data per time segment [1]. For the more complex segments of media files, a higher bit rate (more storage space is required) is allowed by VBR, whereas for less complex segments less space is apportioned. To produce an average bit rate for the file is to be calculated by the average of these rates.

B. Variable Bit Rate Advantages

When compared to the same data of CBR file, VBR produces a better quality-to-space ratio. To encode the sound or video data more accurately by using the available bits in flexible manner, more bits are used in difficult-to-encode passages whereas in less demanding passages the fewer bits are used.

C. Variable Bit Rate Disadvantages

Some hardware may not be compatible with VBR files for the complex process because it takes more time to encode. When the instantaneous bit rate passes the data rate of the communication path in streaming, some problem may present in VBR. During encoding or (at the price of enhanced latency) or by elaborating the play out buffer it debars those problems by confining the instantaneous bit rate [14].

III. DYNAMIC HEADLIGHT PREFETCHING

The headlight prefetching is proposed for media streaming in mobile environments. It has headlight prefetching zone that is a virtual fan-shaped area along the direction of user movement similar to the headlight of a vehicle shown in figure 1and 1.1. All service access pointers (SAP) of the cells that overlapped with the zone are selected as the prefetching SAPs [13].
A. The Headlight Zone And The Computation Of Virtual Illuminance

The problem is in determining the cell area covered by the headlight zone since the intersected area could be in any shape. To avoid the costly computation of the covered area, we use a much simpler approach to approximate the virtual illuminance. More specifically, we partition the headlight zone into smaller grids and pre-compute the virtual illuminance as well as the center of each grid. Since each grid is in a regular shape, the virtual illuminance can be easily computed by the following formula. On the need to determine the segment assignment of a particular cell, we simply add up the illuminance of all grids whose centers fall inside the cell. Since the granularity of the grids can be changed easily, we can have higher level of precision at any time by using finer partitioning [13].

B. Prefetching Segment Assignments

To determine the segment assignment, we need to consider both the user movement and media playing speed. Therefore the number of segments that should be handled by the current cell is \( t_P \) shown in figure 1.2. If the current media segment being played is \( S_i \), then SAPC must prefetch the segments \( S_{i+1}, S_{i+2}, \ldots, S_{i+t_P} \). The first segment that need to be prefetched by SAPC is \( S_{i+t_P+1} \). The expected number of segments to be handled is \( t_P \). The starting segment and the total number of segments to prefetch for all other SAPs within the headlight zone can be determined in a similar way. Since it is clearly not cost worthy for all such SAPs to prefetch the full range of segments, therefore we use the virtual illuminance as a weighting factor to determine the actual number of segments to prefetch. More specifically, the exact segment assignment for SAPC’s to prefetch is Parameters for determining the segment assignment.

C. Headlight shifting

Headlight prefetching is quite effective for largely stable moving users. However, if the user makes a sharp turn, then most or even all of the prefetching done on the previous headlight zone may be completely useless since the user is no longer heading toward the predicted direction. We can of course start a new round of headlight prefetching for the new situation. However, these will double the prefetching cost. Since the media stream is played continuously, the segments needed for the new headlight zone overlap significantly with that of the old zone. Therefore the better way is to shift these segments to the new zone.

D. Headlight Sharing

Headlight shifting only takes the headlight zone of one user into consideration. Segments not yet pre-fetched by any SAP of the old zone can only be retrieved from the remote source. Since the same media may be viewed by more than one user at the same time, especially for hot medias, the headlight zones of different users may have many segments in common. If they overlap with each others, then it is very likely that we can find the needed segments from other zones with or without shifting. We call this idea headlight sharing since segments pre-fetched for a zone by an SAP are shared with neighboring SAPs with overlapping headlight zones. Once a requested segment is located in the neighborhood, the cost of prefetching from the remote server can also be saved.

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Fig. 3.2 Headlight with multi path routing

Fig. 2 Architecture diagram for Dynamic Headlight Prefetching model
IV. PROPOSED MODEL

In this proposed model, multi-level cooperative for Effective data streaming management techniques like VBR, dynamic headlight prefetching (shown in figure 2), multi-user resource allocation and mashed video sense chaining (shown in figure 3). An iterative algorithm to predict continuous link availability between mobile users is proposed. The V3 architecture proposed for live video streaming is essentially a cooperative streaming architecture for moving vehicles. And belongs to our proposed levels, we overcome the propagation delay this is our major contribution of this work.

A. Multi-User Resource Allocation And Mashed Video Sense Chaining

Using the possibilities of mashed sensing in Wireless Multimedia Sensor Network Environment for rate control, error correction and mashing of video, it presents a network system is designed. By a cross-layer system its transmission rate, channel coding rate and encoding rate to maximize the quality of received video and this is the actual objective of our research [4].

First, for transmission over wireless multimedia sensor networks (WMSNs) the encoding of video which is on the mashed sensing is examined. It is expressed that mashed sensing can defeat many of the present issues of video over WMSNs, for the channel errors the encoder complexity and low resiliency [6]. It is shown that the rate of mashed sensed video can be predictably controlled by varying only the mashed sensing sampling rate. The above problem is defeated by the technique called Mashed Sensing (MS) concerning to video over WMSNs [15]. By changing the mashed sensing sampling rate that controls the rate of Mashed Sensed Video (MSV). An option to the traditional video encoders, the MS encoder offers at very low computational complexity by enabling the imaging systems that sense and mash data simultaneously. In order to store or transmit for mashing the large amount of raw data is assumed and captured in conventional digital image or video capturing. The two main disadvantages are there in this process.

First, in some cases CMOS/CCD technology is limited and for particular wavelength assuming the large amount of raw image or video data can be expensive.

Second, in the case of video the computational complex one is mashing the raw data. Mashed Sensing (MS) is one to keep the important information and throw away the rest and the process of sample [16].

Using conventional methods there will be a difficulty to encode or capture many signals but it is possible in Mash Sensing (MS) method. A high-dimensional signal can be retrieved by the random measurements in small number. A mashing algorithm can be employed for each frame at a complete set of samples to be found which is needed by standard video capture systems. Obtaining those raw samples is hard or valuable in applications like imaging at non-visible (e.g. infrared) wavelengths shown in figure 4. In other applications like multi-image capture in camera network, it will be a challenge for implementing a mashing algorithm. In mash imaging hardware like single-pixel, from each frame the random measurements are collected independently and it can reduces these loads and the protocol for mashing is not needed.

B. Rate Change Based on Video Quality

The rate of transmission is depending on the received video quality and the system is based on this MS architecture. The information about the estimated received video quality used by the rate controller and it is mean in the rate control decision. The received video quality is very high which is found by the sending node and to enhance the rate it will be decreased. To enhance the quality of video its data rate is decreased by sending a node of poor-quality video.

C. Video Transmission Using Mashing Samples

The video encoder can be developing based on mashed sensing. At low complexity based on the temporal correlation the frames can be captured and mashed by the difference of two frames of the MS samples.
Here the outcome of these simulations is demonstrated. In this paper, Evalvid tool which is used as an evaluation tool for video quality along with this, visual studio software and network simulator-ns-2 are used for an implementation of the simulations was executed.

**V. IMPLEMENTATION**

Fig. 4 Model level diagram

Fig. 5 Implementation Result
VI. RESULT DISCUSSION

As a function of a channel bit rate, maximum allowable delay and capability of error correcting in WMSN’s, we have carried a wide model to analyze the efficiency and robustness of VBR. Here the outcome of these simulations is demonstrated. In this paper, Evalvid tool which is used as an evaluation tool for video quality along with this, visual studio software and network simulator-ns-2 are used for an implementation of the simulations was executed. By way of energy utilization, average peak signal-to-noise ratio (PSNR), delay-constrained PSNR, cumulative jitter and frame loss rate, the performance of delay control schemes is examined. For capturing, encoding and broadcasting the live video sequences to a sink node, 10 sensor nodes for video were located randomly in a 200-200m area in our simulation. Within the area, from a set the pair for the sender/receiver was selected in random manner. The scope of maximum transmission is 40m and size of the unique queue is 100 for each node. The protocol for routing will be AODV and for medium access control is CSMA. At QCIF resolution and 30fps frame rate, the feature for the motion, size of frame and quality will be vary for the video sequences, here we are using Foreman, Coastguard and Akiyo video sequences. With the video encoder software called FFmpeg, at a rate of 200kpbs, with MPEG4 the compression of the frames takes place. Concerning energy efficiency, the frames were packetized into 100-byte video packets. MicaZ mote hardware specification, the parameters that relate energy were fixed. With different random number seeds, all the simulations were executed 20times and over all consequence were utilized for the results and it is averaged by means of these. Industrial process control, the multimedia sensor nodes, traffic avoidance, control systems and multimedia surveillance is the long-familiar application of WMSN’s which are accepted to be firm. For the subjective (perceived) video sequences of foreman and coastguard results were examined in this analysis section because of the restriction of space, where video sequence of Akiyo were demonstrated in other section.

In terms of allowed error shield and improvements, the mechanisms for error checking there will be a similar behavior and the comparative performance is studied apart from the three video sequence’s different features. And its result shown in figure 5.

VII. CONCLUSIONS

The study on the Quality of Delivery (QoD) of variable bit rate videos over a live video transmission system that uses a scalable source code with headlight pre-fetching and P2P (Peer-to-Peer) chaining. In the face of fast changing moving patterns, the techniques achieve their effectiveness by continuous monitoring of QoS and processing cost, and then adjust the streaming service strategies accordingly. Furthermore, smooth integration of the multi levels of cooperation provides even higher quality of services to mobile users at lower cost. The proposal is that the real-time algorithm for selecting the channel packet length together with an appropriate source-channel rate allocation.

Even with effective adaptation techniques, detrimental playback interruption can still occur. All strategies can only be applied after receiving the media requests from the users. No matter how well it is managed to pre-fetching and P2P streaming, the instability of wireless communication and the unpredictability of user movement can still lead to disconnection and, therefore, playback interruption or long download time. It has been currently investigated that a bidirectional push and pull technique to actively disseminate information towards their most likely consumers as well as forward requests towards close by neighbors that are most likely to possess the needed answers. Working together with client caching, it is possible to extensively improve service quality.

Another possible remedy of the problem is to develop personalized data service solution on the user activities. Using behavior-mining techniques, it is possible to identify user activities and predict the next location and/ or service invocation. In such case, it is possible to provide proactive services which are expected to significantly reduce the likelihood of playback interruption. This solution was robust against changes in the sequence content. The systems have good end-to-end performance in packet erasure and wireless channels. Their low complexity makes them suitable to live video streaming applications. In the future research about the combination of 3D live media streaming and handheld Augmented Reality (AR) technology can bring the technology from research lab to the real world. It is concluded that the users feel the media presentation with 3D graphic and AR technology is more interesting than general 2D game, the immersion of virtual object in real world.

ACKNOWLEDGMENT

Our thanks to the experts who have contributed towards development of the work.

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