International Journal of Engineering Innovation & Research
Volume 2, Issue 3, ISSN: 2277 – 5668

Multiple Description Coding Based Video Streaming On JXTA Peer-to-Peer Network

Malatesha P.
Department of CSE
Siddaganga Institute of Technology, Tumkur, Karnataka, India
Email: malteshp5@gmail.com

Ashwini B. P.
Department of CSE
Siddaganga Institute of Technology, Tumkur, Karnataka, India
Email: ashvinibp@gmail.com

***Abstract* – A P2P network is a permanent infrastructure which links computers in a small office with copper wires or a P2P network is also network on a much grander scale in which special protocols and applications set up direct relationships among users over the Internet. Video streaming applications have newly attracted a large number of participants in a distribution network. Traditional client-server based video streaming solutions sustain precious bandwidth provision rate on the server. Recently, several P2P streaming systems have been organized to provide On-Demand and live video streaming services on the wireless network at reduced server cost. Peer-to-Peer (P2P) computing is a new pattern to construct disseminated network applications. Typical error control techniques are not very well matched and on the other hand, error prone channels have decreased the handling of video data greatly for video transmission over wireless networks and wired networks based on IP protocol.**

These two facts united together provide the essential motivation for the development of a new of technique that is capable of dealing with transmission errors in video systems. In this paper, the system has flexible multiple description coding method which improves the frame loss possibilities over independent paths. It introduces concealment technique at the receiver and to conceal the lost frames more effectively. Experimental results show that, the approach attains reasonable quality of video performance over P2P network.

The paper work is carried out on the JXTA framework of java platform. The JXTA is used to build the P2P overlay network. The handling of the video data is performed using the JMF and Fobs4JMF libraries of the java language.

***Keywords* – Content Sharing, Data Sharing, Intranet, Multimedia Streaming, Peer-To-Peer Networks, Self Configurable, Video Streaming.**

I. Introduction

In its simplest form, a peer-to-peer (P2P) network is created when two or more Computers are connected and share resources without going through a separate server computer. A P2P network can be an ad hoc connection—a couple of computers connected via a Universal Serial Bus to transfer files. A P2P network also can be a permanent infrastructure that links half-dozen computers in a small office over copper wires or a P2P network [2] can be a network on a much grander scale in which special protocols and applications set up direct relationships among users over the Internet.

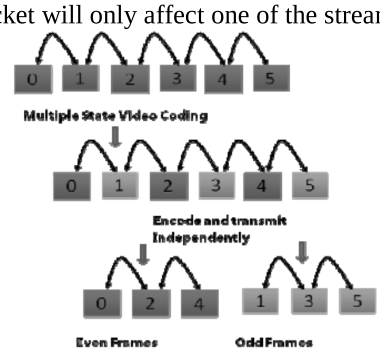
The initial use of P2P networks in business followed the deployment in the early 1980s of free-standing Computers. In contrast to the mini-mainframes of the day, such as the Virtual system from Wang Laboratories Inc., which served up word processing and other applications to dumb terminals from a central computer and stored files on a central hard drive, the then-new PCs had self-contained hard drives and built-in Central Processing units(CPUs). The smart boxes also had onboard applications, which meant they could be deployed to desktops and be useful without an umbilical cord linking them to a mainframe.

Content distribution on the Internet uses many different service architectures, ranging from centralized client-server to fully distribute. The recent wide-spread use of peer-to-peer applications such as SETI, Napster, and Gnutella indicate that there are many potential benefits to fully distributed peer-to-peer systems. Peer-to-peer content distribution provides more resilience and higher availability through wide-scale replication of content at large numbers of peers.

II. Architecture

Multiple description coding method, the original video sequence which is encoded into two sub sequences of frames (even and odd), and they are divided into two separate bit streams. Specifically, each stream has a different state and a different prediction loop, which can be independently decoded to produce a signal of basic quality. In general there can be multiple coded streams each with its own state referred as Multiple States or Multiple State Streams as shown in Figure 2. The proposed method is conceptually related to multiple descriptions coding, however it differs in the account used for each description and most importantly in its use of state recovery.

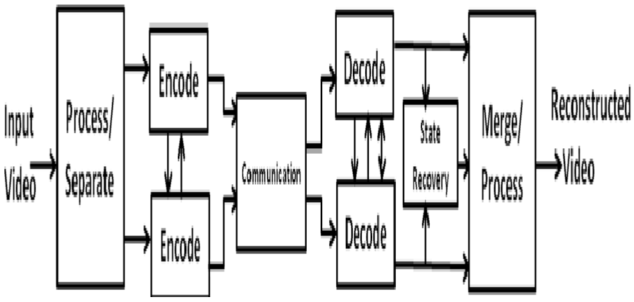
The different streams should be transmitted over different channels undergoing independent error effects to minimize the chance that both streams are lost. For example, the bit streams from the even and odd frames can be sent in different packets over a packet network, so that any lost Packet will only affect one of the streams.



A. Objectives

The main objective of this work is to enhance P2P video streaming by using advanced video coding techniques, mainly layered video and to design appropriate video streaming techniques based on the MDC technique over peer-to-peer network structures, and to develop schemes to compare and evaluate these video streaming mechanisms. Specifically, this is to focuses on the following issues.

1. Server selection in replicated batching video on demand (VoD) systems
2. Scalable video streaming with time shifting and video patching
3. A Cooperative patching architecture in overlay networks
4. A peer to peer video streaming architecture



In this paper, the objective is to provide an investigation on, how to use layered video in P2P networks is shown. There is a design of protocols, are meant to provide built-in incentives and demand/resource adaptation in P2P video streaming. Another investigation is to show how to apply multi-stream video coding, including multiple descriptions coding (MDC) and layered coding, on P2P video-on-demand. Conventional MDC simplifies the system design by producing equally important descriptions, but it has a lower coding efficiency and bandwidth utilization. Conventional layered coding has a higher video coding efficiency, but it needs sophisticated layer caching and scheduling schemes to provide unequal protection to different layers. Like MDC, with the proposed approach, all sub streams have equal importance. Thus, video quality gracefully degrades as sub streams are lost, independently of which particular sub streams are lost. Like layered coding, only the source bits are collectively transmitted by the supplying peers, increasing the bandwidth utilization in the system. Compared with conventional layered coding and MDC, the proposed solution achieves the maximum system performance in terms of the received video quality, with the minimum consumed storage in peers.

B. Multiple Description Coding

MDC (Multiple Description Coding) was first invented by the Bell Laboratories. The idea was to transmit data over multiple (telephone) lines to achieve higher reliability. If one line would fail, the signal still could reach the target through the other lines, but with reduced quality.

In video streaming the idea of MDC is to split a single stream into several descriptions (bit streams) and transmit them over several channels [4, 5] to the target. Each description contains a part of the original stream. To restore the original picture all descriptions are needed. The advantage here is, in order to see the video stream one description is sufficient. If one description is lost the video stream still can be played but with lesser quality [6]. MDC is especially helpful in case of unreliable transport channels and the growing interest in voice, image and video communications over the Internet. For example, the loss of one packet can lead to the loss of a large number of source samples and hence in an interruption of the stream. But with MDC there won't be any interruption, only variations in the stream quality. In the next few sub-sections there will be an introduction into four different multiple description coding schemes. All presented coding schemes are based on the video codec standard H.264/AVC [1]. The codec was developed by the ITU-T Video Coding Experts Group (VCEG) together with the ISO/IEC Moving Picture Experts Group (MPEG). It is a block based motion estimation codec standard with the capability to provide good video quality at substantially lower bit rates than previous standards and having enough flexibility to be applied to a wide variety of applications on a wide variety of networks and systems, including low and high bit rates, low and high resolution video, broadcast, DVD storage, RTP/IP packet networks, and ITU-T multimedia telephony systems and therefore the most suitable video codec for video streaming over the internet. MDC schemes can be grouped into two sets: The first group exploits the spatial correlation within each frame of the sequence when creating the descriptions. The second group takes advantage of the temporal correlation between the subsequences obtained by the temporal sampling of the original video sequence.

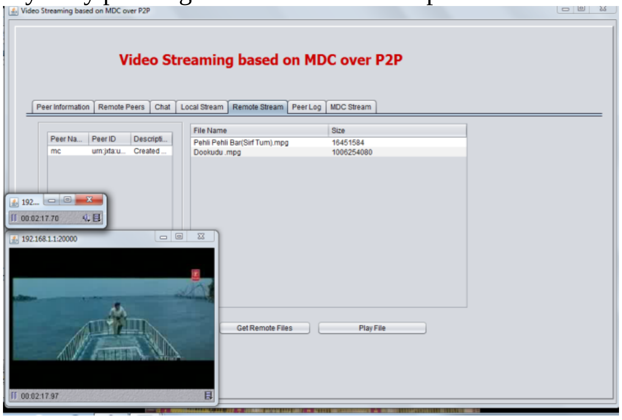
C. MDC Decoder

Similar to the encoder, the decoder alternates the previous decoded frame to perform the prediction. If there are no errors and both the even and odd streams are received correctly, then both streams are decoded to produce the even and odd frames which are interleaved to produce basic video display. If a stream has an error then the state for that stream is incorrect and there is a error propagation for that stream. However, the other independently decodable stream can still be accurately and straightforwardly decoded to produce usable video. For example, if the bit stream corresponding to the odd frames is lost, the even frames may still be decoded and displayed, recovering the video at half its original frame rate.

III. Experimental Results

On completion of the addition of the audio/video file to the list and on completion of the building of the remote file list. The next task is to fetch the audio/video list from the remote peer.

This is action happen by pressing the Get Remote File button. This action will retrieve the audio/video media information into the File list Shared table. The File List Shared table contains only the information that is shared by a particular peer. This table can be refreshed by pressing the Refresh File button. Any one of the shared information can be deleted from the list by using the Remove File button press. The Shared media can be played by pressing the Add File button option.



The playing of audio/video file will happen either local or remote to the peer. To play the local peer audio/video file is to select the file from the Local File List and then to press the Play File button option. This option will open a player window which streams out the time based media over that which has control for pausing, forwarding and rewinding for the media play. The playing of one video local file is shown in the above figure.

IV. Conclusion

A self-configurable system, which shows that the IP address, peer port, transmission port, reception port management are critical and requires to configure carefully. The system has presented the effective management of all these critical issues. The peer connection management is implemented in such a way that it will not loose the packet information during the transmission. All the commercial video products reviewed in this report are optimized for low bandwidth modem or ISDN connections and are not designed to scale to higher bandwidth networks. The video needs to be pre-encoded with the target audience in mind. The commercial products have adopted or developed their own proprietary standards, embraced the currently accepted standards (For example, MPEG) or implemented a combination of the two. Compatibility between the commercial products has been limited because of these proprietary standards. However, recent products such as Sun's Media Framework API and Microsoft's NetShow have been designed to enable new and various codecs to be easily incorporated into their framework.

The most critical aspect implemented in this work is the Streaming module which shows how to stream between the many peers in parallel. This solution is viable and much needed development support for building complex P2P applications, which demonstrates through a few complex application prototypes for multimedia streaming.

In this work, a P2P experimental framework is defined in order to show that MDC scheme is a good option for P2P streaming of video, since even at a high rate packet loss one description is received, which grants the reconstruction of the signal.

References

[1] Marisa Quaresma, Angelo M. Arrifano, Manuela Pereira, Mario M. Freire, and Marc Antonini, "Robust Peer-to-Peer Video Streaming Based on Multiple Description Coding", TRAMANET Project contract PTDC/EIA/73072/2006, Portuguese Fundação para a Ciência e a Tecnologia, September 2009.

[2] J. Petotalo, J. Harju, A. Jantunen, M. Saukko, L. Vtminen, I. Curcio, I.Bouazizi, and M. Hannuksela, "Peer-to-peer streaming technology survey" , in *Proc. International Conference on Networking*, Cancun,pp.13-18, Apr. 2008.

[3] E. Akyol, A.M. Tekalp, and M.R. Civanlar, "A flexible multipledescription coding framework for adaptive peer-to-peer video streaming", IEEE Journal of Selected Topics in Signal Processing, Vol. 1, No. 2, pp.231-245, 2007.

[4] Zezza S, Magli E, Olmo G, Grangetto.M, (2009) "Seacast, A protocol for peer-to-peer video streaming supporting multiple description coding", Proceedings of ICME on Multimedia and Expo, doi:10.1109/ICME.2009.5202819, pp:1586- 1587.

[5] "Multiple description for robust Scalable Video Coding" D. Alfonso, R. Bernardini, L. Celetto, R. Rinaldo, P. Zontone STMicroelectronics, AST,Conference Proceeding: Proceedings / ICIP International Conference on Image Processing 12/2009; DOI:10.1109/ICIP.2009.5414051.

[6] "Robust Peer-to-Peer Video Streaming Based on Multiple Description Coding" Marisa Quaresma, Ângelo M. Arrifano, Manuela Pereira, Mário M. Freire, and Marc Antonini are with the Instituto de Telecomunicações, Department of Computer Science, University of Beira Interior, Rua Marquês d'Ávila e Bolama, P-6201- 001 September 23, 2009. PTDC/EIA/73072.

[7] O. Campana, R. Contiero, and G. A. Mian, "An H.264/AVC video coder based on a multiple description scalar quantizer," IEEE Trans. Circuits Syst. Video Technol., vol. 18, no. 2, pp. 268–272, Feb. 2008.

[8] Yong Liu, Yang Guo and Chao Liang, (2006), "A survey on peer-to-peer video streaming systems", Journal of Peer-to-Peer networking and Applications, Springer, Vol:1, No.1, doi: 10.1007/s12083-007-0006-y, pp. 18-28.

[9] JXTA: Java™ P2P Programming By Daniel Brookshier, Darren Govoni, Navaneeth Krishnan, Juan Carlos Soto Publisher: Sams Publishing Pub Date: March 22, 2002 ISBN: 0-672-32366-4

Author's Profile

Malatesha.P

pursuing his M. Tech in Computer Network and Engineering from the department of Computer Science & Engineering in Siddaganga Institute of Technology, Tumkur under Vishveshvaraya Technological University (VTU), and received his B.E in 2011 from Hirasugar Institute of Technology, Nidasoshi, Belgaum under VTU, Belgaum, Karnataka. His major field of study is on wireless networks.

Ashwini B. P.

completed B.E in Computer Science and Engineering from Oxford College of Engineering, Bangalore under Vishveshvarya Technological University (VTU). She obtained her M. Tech. in Computer Science and Engineering from RV College of Engineering, Bangalore under VTU, Belgaum, Karnataka. She is currently working as Assistant Professor in Siddaganga Institute of Technology in Tumkur, Karnataka. Her areas of interest in research are mainly in energy efficient algorithms for security in wireless sensor networks.