Smart Online Video Streaming using Markov Algorithm

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Abstract- *While demands on video traffic over computer networks have been souring, the wireless link capacity cannot keep up with the traffic demand. The gap between the traffic demand and the link capacity, along with time-varying link conditions, results in poor service quality of video streaming over computer networks such as long buffering time and intermittent disruptions. Leveraging the Markov algorithm, propose a new computer video streaming framework, Smart online Video Streaming. These construct a private agent to provide video streaming services efficiently for each user. For a given user, Private server adaptively adjusts the streaming flow with a scalable video coding technique based on the feedback of link quality. Likewise, monitors the network interactions among internet users and their private agents try to prefetching video content in advance. It is shown that the private server in the network can effectively provide the adaptive streaming, and perform video playing (i.e., prefetching) based on the network analysis.*

Keywords- Video Streaming, Markov process, Bandwidth, Sub Server

I. INTRODUCTION

Over the past decade, increasingly more traffic is accounted by video streaming and downloading. In particular, video streaming services over computer networks have become prevalent over the past few years for online videos. While the video streaming is not so challenging in nearby wired networks, fetching data from distanced networks have been suffering from video traffic transmissions over scarce bandwidth of wireless links. Despite network operators desperate efforts to enhance the bandwidth, soaring video traffic demands from users are rapidly overwhelming the websites link capacity.

Video streaming services should support a wide spectrum of computing devices; they have different video resolutions, different computing powers, different wireless links and so on. Also, the available link capacity of user device may vary over time and space depending on its data transfer strength, other users traffic in the same cell, and link condition variation. Storing multiple versions (with different bit rates) of the same video content may incur high overhead in terms of storage and communication.

II. METHODOLOGIES

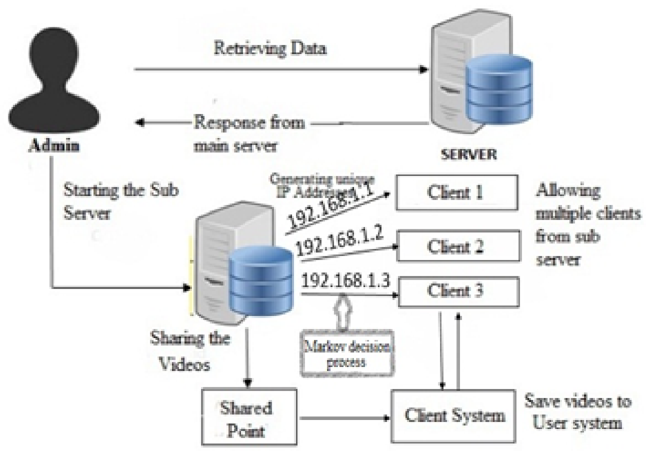
To address this issue, the Scalable Video Coding technique of the H.264 AVC video compression standard defines a base layer with multiple enhance layers. These sub streams can be encoded by exploiting three scalability features:

(i) Spatial scalability by layering image resolution
(ii) Temporal scalability by layering the frame rate, and
(iii) Quality scalability by layering the image compression. By the SVC, a video can be decoded/played at the lowest quality if only the base layer is delivered. However, the more enhance layer can be delivered, the better quality of the video stream is achieved.

While receiving video streaming traffic via networks, Online learners often suffer from long buffering time and intermittent disruptions due to the limited bandwidth and link condition fluctuation caused by multi-path fading and user mobility.

Traditional video streaming techniques designed by considering relatively stable traffic links between servers and users, perform poorly in critical environments. Thus the fluctuating wireless link status should be properly dealt with to provide 'tolerable" video streaming services. To address this issue, we have to adjust the video bit rate adapting to the currently time-varying available link bandwidth of each user. Such adaptive streaming techniques can effectively reduce packet losses and bandwidth waste. Scalable video coding and adaptive streaming techniques can be jointly combined to accomplish effectively the best possible quality of video streaming services. That is, we can dynamically adjust the number of SVC layers depending on the current link status.
However most of the proposals seeking to jointly utilize the video scalability and adaptability rely on the active control on the server side. That is, every user needs to individually report the transmission status (e.g., packet loss, delay and signal quality) periodically to the server, which predicts the available bandwidth for each user. Thus the problem is that the server should take over the substantial processing overhead, as the number of users increases.

III. SYSTEM ARCHITECTURE:



A. Server Process Formulation

The video streaming process can also be considered as the interaction between two modules. The downloading and estimation steps can be viewed as an integrated environment module, and the rate adaptation agent can be viewed as an agent module. The video streaming process can be formulated as a reinforcement learning task. The environment starts a server for multiple clients to distribute videos, and the agent will determine the best action correspondingly. For each action, the environment replies a reward to the agent.

B. Markov decision process

Markov model is used to estimate the future bandwidth. The bandwidth of each link will be divided into several client regions. Each region will represent a state of the Markov channel model, and the total number of the states is equal to the number of regions. Once a segment has been successfully downloaded, the transmission bandwidth can be calculated by dividing the total size of the data transmitted over the total transmission time.

C. Video Requisition

The network channels are highly dynamic; it is very challenging to provide high quality video streaming services for video users consistently. It is a promising trend to use multiple client network interfaces with different communication techniques for computing devices.

D. Bandwidth Estimation

In this module using a homogeneous Markov chain to estimate the available bandwidth, in our work, a heterogeneous and time-varying Markov model is used to estimate the future bandwidth. The bandwidth of each link will be divided into several regions. Each region will represent a state of the Markov channel model, and the total number of the states is equal to the number of regions.

IV. RESULTS

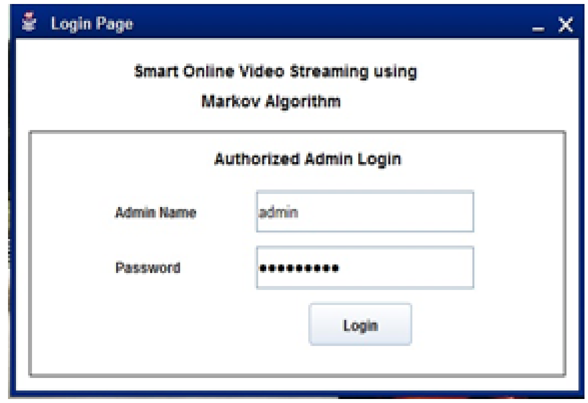


Fig.4.1 Home page for admin login into the sub server.

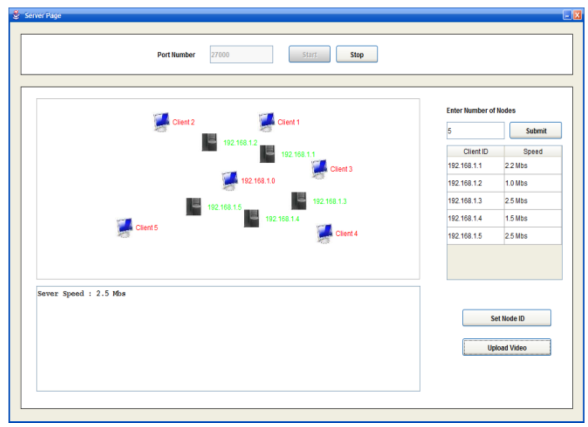


Fig.4.2 starting the server for multiple clients with unique ip addresses.

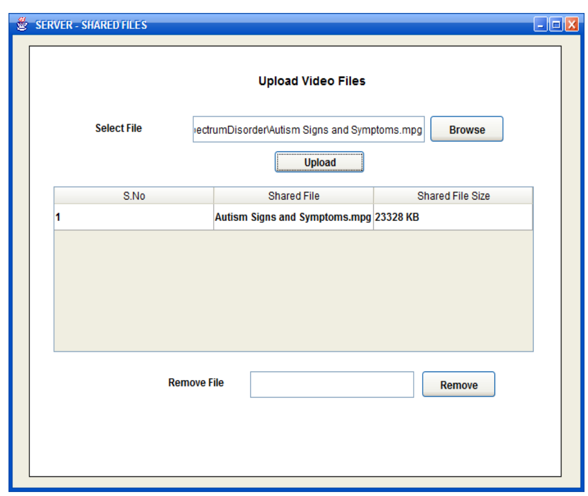


Fig.4.3 uploading process in sub server by admin.

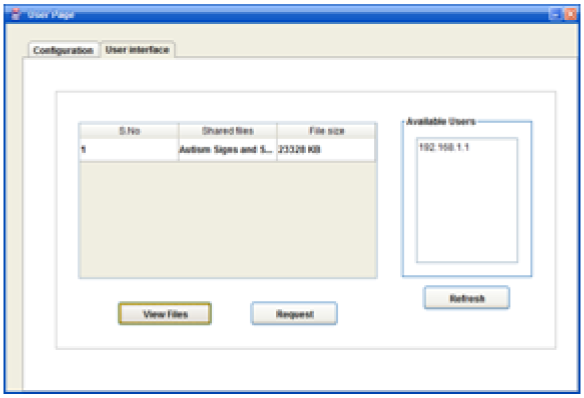


Fig.4.4 Client accessing the video files from the sub server.

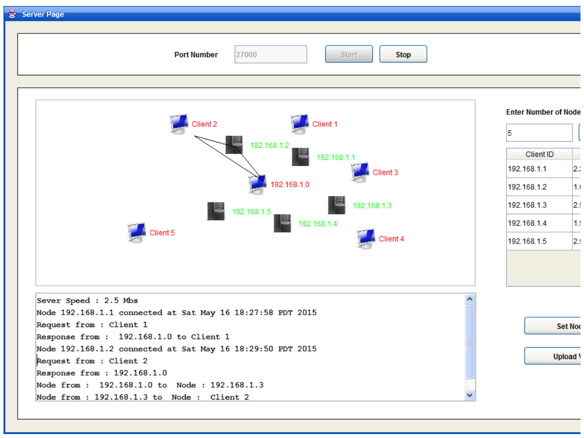


Fig.4.5 streaming process from main system to client systems.

Fig.4.6 Playing the shared video files.

V. CONCLUSION

In this project proposed a real-time adaptive best-action search algorithm for video streaming over multiple wireless access networks. First formulated the video streaming process as an MDP. To achieve smooth video streaming with high quality, we carefully designed the reward functions. Second, with the proposed rate adaptation algorithm can solve the MDP to obtain a sub-optimal solution in real time. Last implemented the proposed algorithm and conducted realistic experiments to evaluate its performance and compare it with the state-of-the-art algorithms. The experiment results showed that the proposed solution can achieve a lower startup latency, higher video quality and better smoothness.

FUTURE WORK

There are still many open issues to investigate in the future. First, how to better allocate the loads between several links with finer granularity should be investigated. Second, to better predict the future bandwidth, the most recent estimation of bandwidth should be assigned with a higher weight. Last but not least, the size of the video segment should be further considered for variable bit rate (VBR) videos to improve the bandwidth estimation accuracy.

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