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An Instantaneous Robust Algorithm for Cartridge Torrent above Various Wireless Admittance Set of Connections

Amrutha George [1], V.Vijayadeepa[2]

Research Scholar, Dept. of CS, Muthayammal College of Arts & Science, Rasipuram, Namakkal, India[1]

HOD, Dept. of CS, Muthayammal College of Arts & Science, Rasipuram, Namakkal, India[2]

ABSTRACT: some insight and background into the Dynamic Adaptive Streaming over HTTP (DASH) specifications as available from 3GPP and in draft version also from MPEG. Specifically, the 3GPP version provides a normative description of a Media Presentation, the formats of a Segment, and the delivery protocol. In addition, it adds an informative description on how a DASH Client may use the provided information to establish a streaming service for the user. In order to maintain high video streaming quality while reducing the wireless service cost, the optimal video streaming process with multiple links is formulated as a Markov Decision Process (MDP). The reward function is designed to consider the Quality of service (QoS) requirements for video traffic, such as the startup latency, playback fluency, average playback quality, playback smoothness and wireless service cost. To solve the MDP in real time, propose an adaptive, best-action search algorithm to obtain a sub-optimal solution. To evaluate the performance of the proposed adaptation algorithm, implemented a testbed using the Android mobile phone and the Scalable Video Coding (SVC) codec. Experiment results demonstrate the feasibility and effectiveness of the proposed adaptation algorithm for mobile video streaming applications, which outperforms the existing state-of-the-art adaptation algorithms.

KEYWORDS: DASH, quality of service, Markov Decision Process, Video Coding

I. INTRODUCTION

Internet access is becoming a commodity on mobile devices. With the recent popularity of smart phones, smart books, connected netbooks and laptops the Mobile Internet use is dramatically expanding. According to recent studies, expectations are that between 2009 and 2014 the mobile data traffic will grow by a factor of 40, i.e., it will more than double every year. The video traffic will by then account for 66% of the total amount of the mobile data. At the same time mobile users expect high-quality video experience in terms of video quality, start-up time, reactivity to user interaction, trick mode support, etc., and the whole ecosystem including content providers, network operators, service providers, device manufacturers and technology providers need to ensure that these demands can be met. Affordable and mature technologies are required to fulfil the users' quality expectations. One step into this direction is a common, efficient and flexible distribution platform that scales to the rising demands. Standardized components are expected to support the creation of such common distribution platforms.

Video streaming is gaining popularity among mobile users recently. Considering that the mobile devices have limited computational capacity and energy supply, and the wireless channels are highly dynamic, it is very challenging to provide high quality video streaming services for mobile users consistently. It is a promising trend to use multiple wireless network interfaces with different wireless communication techniques for mobile devices. For example, smart phones and tablets are usually equipped with cellular, WiFi and Bluetooth interfaces. Utilizing multiple links simultaneously can improve video streaming in several aspects: the aggregated higher bandwidth can support video of higher bit rate; when one wireless link suffers poor link quality or congestion, the others can compensate for it. High resilience to bandwidth variation and easy deployment are both important requirements for video streaming applications. Currently, progressive download, one of the most popular and widely deployed streaming techniques,

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buffers a large amount of video data to absorb the variations of bandwidth. Meanwhile, as video data are transmitted over HTTP protocols, the video streaming service can be deployed on any web server.

II. LITERATURE SURVEY

DASH has been a hot topic in recent years. There are many commercial products which have implemented DASH in different ways, such as Apple HTTP Live Streaming and Microsoft Smooth Streaming. Since the clients may have different available bandwidth and display size, each video will be encoded several times with different quality, bit rate and resolution. All the encoded videos will be chopped into small segments and stored on the server, which can be a typical web server. These small segments will be downloaded to the browsers' cache and played by the client(browser or browser plug-in). The video rate adaptation is performed at the client side, which is also called the pull-based approach. The client will determine the quality version of the requested video segment according to its current available bandwidth, resolution and the number of buffered unwatched segments. After the current segment is completely downloaded, the rate adaptation algorithm will be invoked again for the next segment. There is extensive work covering this topic. The authors proposed to estimate the bandwidth by a statistical method, and they took both the quality contribution and decoding time of each segment into consideration. K.P. Mok *et al.* presented a QoE aware DASH system. Their algorithm estimates the available bandwidth by probing with the video data. In order to keep the quality level as smooth as possible, their algorithm will switch the video quality version gradually and will try to maintain the buffer level being stable. To overcome this disadvantage, in Evensen *et al.* suggested dividing each segment into small sub-segments, and these sub-segments can be downloaded through different links. Their algorithm estimates the available bandwidth according to the throughput of the previous segment, and selects the video quality version most close to the estimated bandwidth. In the evaluation section, we will compare the performance of our proposed solution.

III. EXISTING SYSTEM

In the authors summarized three typical schemes of utilizing multiple links. They compared the performance of these schemes through extensive simulations. Kaspar *et al.* proposed an approach to implementing DASH over multiple links. In their algorithm, each segment will be transmitted over one link. Thus multiple segments can be transmitted at the same time.

Disadvantages of existing system:

- The smart phones only have limited storage space, it is impractical to maintain a very large buffer size.
- The buffered unwatched video may be wasted if the user turns off the video player or switches to other videos.
- Download typically does not support transmitting video data over multiple links.

IV. PROPOSED SYSTEM

In this paper we proposed dynamic adaptive streaming over HTTP has been proposed. In a DASH system, multiple copies of pre-compressed videos with different resolution and quality are stored in segments. We formulate the multi-link video streaming process as a reinforcement learning task. For each streaming step, we define a state to describe the current situation, including the index of the requested segment, the current available bandwidth and other system parameters. A finite state Markov Decision Process (MDP) can be modeled for this reinforcement learning task. The reward function is carefully designed to consider the video QoS requirements, such as the interruption rate, average playback quality, and playback smoothness, as well as the service costs.

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ADVANTAGES OF PROPOSED SYSTEM:

Smooth and high quality video streaming. Avoid playback interruption and achieve better smoothness and quality.

V. SYSTEM MODEL AND STREAMING PROCESS FORMULATION

System Model:

We consider how to utilize multiple wireless access networks together for video streaming, *e.g.*, using a combination of cellular, WiFi, and/or Bluetooth simultaneously. Here, as an example, Bluetooth and WiFi access networks are considered as we do not have end-to-end control over cellular links, and our work can be extended when other types of wireless access networks or more than two wireless access networks are used1. Since a wireless channel may suffer from time-varying fading, shadowing, interference and congestion, the available bandwidth of a wireless link may vary all the time. In addition, different smart phones or tablets may have different screen size and resolution.

Streaming Process Formulation

The video streaming process can also be considered as the interaction between two modules. The downloading and estimation steps in the top grey rectangle 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 sends a state signal for each video segment to the agent, and the agent will determine the best action correspondingly. For each action, the environment replies a reward to the agent. Considering the Markov property of the system states, a Markov Decision Process (MDP) can be formulated for the streaming process, and the state transition model of the Markov process needs to be devised.

VI. IMPLEMENTATION AND ALGORITHM

Bandwidth Estimation:

Rapid network load changes and short-term outages are difficult to predict, and the resultant available bandwidth for a session becomes a time-varying random process. Thus, instead of 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.

Real-time Search Algorithm

If only part of the future steps are considered, a sub-optimal solution can be obtained. Based on this idea, we develop a real-time recursive best-action search algorithm, which is shown in Algorithm 1. To meet the requirement of the real-time search, an important issue is to reduce the search duration for each state to an acceptable value. We achieve this goal by setting a small search depth D to invoke the search algorithm. For the current state s, all the possible actions $A(s)$ will be enumerated. The recursive reward search algorithm is invoked to obtain the reward of state s with action a by enumerating all the possible future states $S\_$ and their associated actions $A\_(s)$.

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Algorithm1: Real-time Search Algorithm

procedure GETBESTACTION(*s*)
Initialize *action*←−1, *Qmax* ←−∞
Generate all possible actions *A*(*s*) for state *s*
for all Action *a* ∈ *A*(*s*) **do**
q ← REWARDSEARCH(*s*,*a*, 0)
if *q* > *Qmax* **then**
Qmax ← *q*, *action* ← *a*
end if
end for
return *action*
end procedure

procedure REWARDSEARCH(*s*, *a*, *d*)
q ← reward of (*s*,*a*)
if *d* ≥ *D* **then**
return *q*
end if
Generate all possible next states *S* of (*s*, *a*)
for all *s'* from *S'* **do**
Qmax ←−∞
Generate all possible actions *A'*(*s*) for state *s*
for all Action *a'*∈ *A'*(*s*) **do**
Qt ← REWARDSEARCH(*s'*, *a'*, *d*+ 1)
if *Qt* > *Qmax* then
Qmax ← *Qt*
end if
end for
q ← *q* + *γPss' Qmax*
end for
return *q*
end procedure

Adaptive Search Depth

Search depth is an important issue in our work. The search depth can determine how good the search result is, and a larger value of depth will achieve a better result. Meanwhile, with the increment of the search depth, the search time to obtain the action for a segment will be increased exponentially. Therefore, the search depth can be viewed as a trade-off between the video quality and the search time. Based on several preliminary experiment results, when the search depth *D* is larger than three, it will take more than two seconds to obtain a decision on the test Android smart phone. Thus, the maximum search depth *Dmax* is set to three.

VII. RESULT ANALYSIS

To reduce the search time of our real-time best-action search algorithm, we implemented it in a non-recursive way. According to the experiments, we found that the running time of the algorithm is about 2 ms when the depth *D* = 1, 42 ms when *D* = 2, and 513 ms when *D* = 3, respectively. Therefore, we set the adaptive searching depth region as *q*1 = 8 segments and *q*2 = 15 segments.

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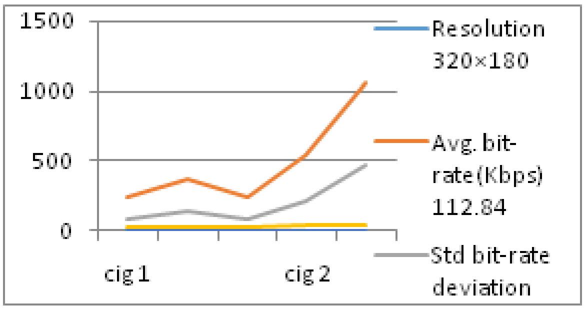

Fig 3. Video Coding Configurations

VIII. CONCLUSION AND FUTURE WORK

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, 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. 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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BIOGRAPHY

Ms.Amrutha George has born on 4.12.1992 in Tamilnadu, India. She received B.Sc. degree from Mary Matha Arts and Science College,Affiliated to Kannur University, Kannur (2009-2012)Kerala (India).She received MCA in 2014 from Muthayammal College Of Arts And Science,Affiliated to Periyar University Tamilnadu, India. She is Pursuing M.phil (full time) from Muthayammal College of Arts & Science in Periyar University, Salem, Tamilnadu, India. Her interested area is omputer Network.

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V.Vijayadeepa, received her B.Sc. degree from university of Madras and M.Sc. degree and MCA degree from Periyar University .She has completed her M.Phil. at Bharathidasan University .She is having 12 years' experience in collegiate teaching and she is the associate professor and Head of the department of computer science and applications in Muthayammal college of arts and science ,Rasipuram affiliated by Periyar university .Her main research interests include personalized web search ,web information retrieval ,data mining, data warehousing and information systems.