On Demand Retrieval of Crowd Sourced Mobile Video streaming and sharing the video: CCMVA

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Abstract — *while demands on video traffic over mobile 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 mobile networks such as long buffering time and intermittent disruptions. Leveraging the cloud computing technology, we propose a new mobile video streaming framework, dubbed CCMVA, which has two main parts: AMoV (adaptive mobile video streaming) and ESoV (efficient social video sharing). AMoV and ESoV construct a private agent to provide video streaming services efficiently for each mobile user. For a given user, AMoV lets her private agent adaptively adjust her streaming flow with a scalable video coding technique based on the feedback of link quality. Likewise, ESoV monitors the social network interactions among mobile users, and their private agents try to prefetch video content in advance. We implement a prototype of the CCMVA-Cloud framework to demonstrate its performance. It is shown that the private agents in the clouds can effectively provide the adaptive streaming, and perform video sharing (i.e., prefetching) based on the social network analysis.*

Key words: *Scalable Video Coding, Adaptive Video Streaming, Mobile Networks, Social Video Sharing.*

1. INTRODUCTION

Cloud computing promises lower costs, rapid scaling, easier maintenance, and services that are available anywhere, anytime. A key challenge in moving to the cloud is to ensure and build confidence that user data is handled securely in the cloud. A recent Microsoft survey found that "...58% of the public and 86% of business leaders are excited about the possibilities of cloud computing. But, more than 90% of them are worried about security, availability, and privacy of their data as it rests in the cloud."

We first illustrate how CCMVA system works by presenting how a user interacts with CCMVA system through the Web interface. CCMVA system is an event-centric mobile video sharing system. Organizers of events such as sports matches and stage performances can register their event with CCMVA system, providing location and time information. Attendees of the event then "check-in" into the event through the CCMVA system mobile client. After that, the attendees begin to capture videos using their smart phones at the event venue for sharing. Periodically, each Smartphone uploads metadata of video that it intends to share.

As shown in Fig -1, the whole video storing and streaming system in the cloud is called the Video Cloud (VC).In the VC, there is a large-scale video base (VB), which stores the most of the popular video clips for the video service providers (VSPs). A temporal video base (tempVB) is used to cache new candidates for the popular videos, while tempVB counts the access frequency of each video. The VC keeps running a collector to seek videos which are already popular in VSPs, and will re-encode the collected videos into SVC format and store into tempVB first.By this 2-tier storage, the AMES-Cloud can keep serving most of popular videos eternally. Note that management work will be handled by the controller in the VC.

Fig -2 illustrates the model. The event plane, AB, is projected to be a horizontal line and C is the center of the line AB. Without loss of generality, we assume that a line that is perpendicular to the event plane has a view angle of 0°. For example, in Figure 2, user U2 viewing along the line X has a view angle of 0°.

INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY (IRJET) E-ISSN: 2395-0056
VOLUME: 02 ISSUE: 03 | JUNE-2015 WWW.IRJET.NET P-ISSN: 2395-0072

We define the view angle of a frame captured in a video clip as the angle between the line representing the view and a line perpendicular to AB. Users U1 (along line Y) and U3 (along line Z) have view angles of µ1 and µ2 respectively.

We define the point-of-interest (POI) of a view captured in a video clip as the position of intersection between the line representing the view and event plane AB. We quantify the POI value as the normalized distance from one end of AB.

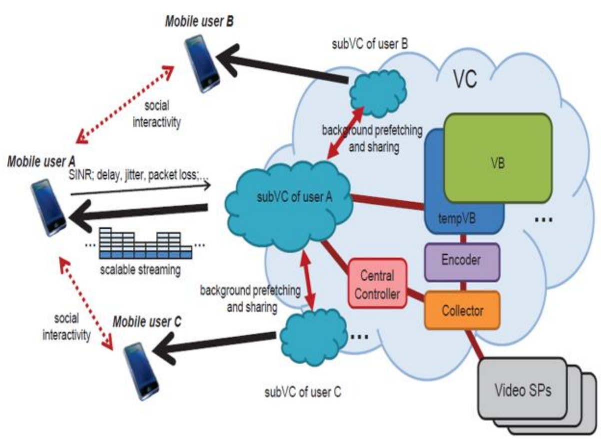

Fig -1: Architecture of CCMVA system.

In Fig -2, the POI of Users U2 (along line X), U4 (along line W) and U3 (along line Z) have POI of 0:5, 0:5+P1 and 0:5 + P2 respectively. While computation of a view angle can be performed relatively easily using the compass sensor available on most modern smartphones.

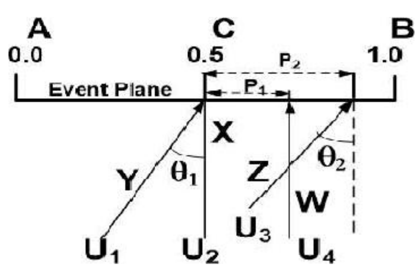

Fig -2: Angle and POI.

2. Literature Review

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy n company strength. Once these things r satisfied, ten next steps are to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration are taken into account for developing the proposed system.

3. Problem Statement

The proposed system is called CCMVA system (rhymes with episode) or MObile VIdeo Sharing On-DEmand. It is event centric as it assumes that mobile videos are grouped according to the event during which the videos are shot. CCMVA system has several key differences from the conventional video sharing approach (e.g. YouTube).

Existing video sharing systems (e.g. YouTube) typically require a video to be uploaded to the server before it can be searched and retrieved using keywords. Searching with keywords, however, is often inadequate as the keywords may be too coarse or inaccurate. In many crowded events, the upload capacity of the network infrastructure is limited due to large amount of upload traffic.

The 2013 Super Bowl XLVII saw a 80% increase in mobile broadband data usage compared to the previous year's event, with about 388 GB data exchanged. Most upload traffic included videos and pictures showing that there is a tremendous user interest in real-time sharing of the event experience. Given that smartphones have energy constraints and mobile broadband bandwidth is a limited (and sometimes costly) resource, an alternative to the upload-all-video-to-server approach becomes an attractive option.

Our work is motivated by the trend towards increased sharing of mobile video from crowded events in a timely manner. We propose a new approach for mobile video sharing that uploads a small amount of metadata information generated on the smartphones to the server initially, instead of uploading the entire video by default. The server will then only fetch relevant videos, in response to user queries. By uploading only a small amount of metadata information to support queries and only upload more data on demand, the network and energy cost on the smartphones are reduced.

4. Proposed Methodology

We propose an adaptive mobile video streaming and sharing framework, called CCMVA system, which efficiently stores videos in the clouds (VC), and utilizes cloud computing to construct private agent (subVC) for each mobile user to try to offer “non-terminating” video streaming adapting to the fluctuation of link quality based on the Scalable Video Coding technique. Also this system can further seek to provide “nonbuffering” experience of video streaming by background pushing functions among the VB, subVBs and localVB of mobile users. We evaluated the CCMVA-Cloud system by prototype implementation and shows that the cloud computing technique brings significant improvement on the adaptivity of the mobile streaming. We ignored the cost of encoding workload in the cloud while implementing the prototype.

A user can place a query in the form of "Show me videos of the event from time t1 to t2, with cameras recording video".

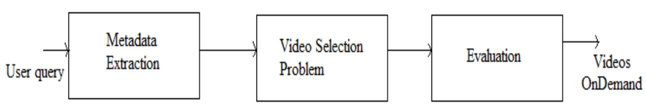

Fig -3: Overview of CCMVA system

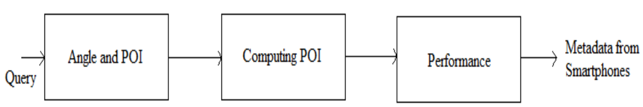

Fig -4: Overview of Metadata Extraction

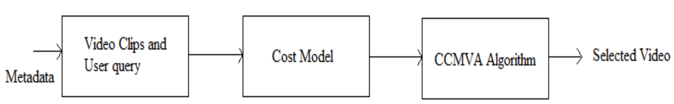

Fig -5: Overview of Video Selection Problem

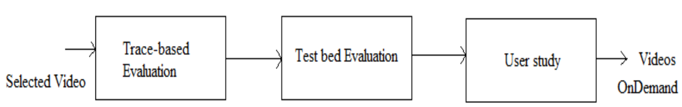

Fig -6: Overview of Evaluation

A. Extracting the Metadata:

A user can place a query in the form of .show me videos of the event from time t1 to t2, with cameras recording video from angle µ and pointing at POI CCMVA system selects the set of clips, based on video metadata previously uploaded by the users, that balances the conflicting objectives of high quality and low cost. Once all the selected clips have been uploaded from the smartphones to the server, its availability is indicated on the web interface.

In order to provide metadata about a user captured video on the smartphones, each Smartphone runs a light-weight metadata extraction scheme. For each video, the metadata extracted, besides the start and end times, are the viewing angle and point-of-interest (POI).

In principle, the POI of an image is computed by finding the horizontal shift in image features between the given image and the reference image. This shift is used to compute the displacement of the video frame's view with respect to the reference image center.

The algorithm thus requires a reference image with sufficient features as an input. The smartphones computes the POI and uploads the average POIs as metadata to the server periodically. Conceptually, POI is computed as the average relative distance of matching interest points found in the given image and the reference image. We compute the POI for video frames sampled at a pre-defined sample rate.

The POI computation runs on the Smartphone and needs to be accurate as well as lightweight. Both image resolution and occlusion could affect the accuracy of the algorithm. We evaluate the impact of image resolution.

B. Selecting the Video:

After the metadata of a video is uploaded from a Smartphone to the server, it is available to be selected as part of a response to a user query.

We now formulate the video selection problem formally. A video segment s is characterized by its the starting time (t1), its ending time (t2), its angle (µs), and its POI (ɣs). A video clip v is a sequence of temporally consecutive, non-overlapping video segments of unit time duration. Three parameters determine the cost: view angle, POI, and the energy consumed. We combine these parameters into a cost model by representing them in a 3D Cartesian co-ordinate system.

We now present our solution to the video selection problem. We called our algorithm CCMVA or Cost and Coverage-aware Mobile Video Aggregator. CCMVA runs on the server. The input to CCMVA is the metadata of a set of video clips V, energy consumption to upload a video segment for each device, and the query q. We assume that every video clip either overlaps with the interval or is contained within the interval. Otherwise the clip would not be in the query result and can be omitted. Segments of same interval duration are assumed to be of same size.

C. Process of Evaluation:

We evaluate CCMVA system in three different ways. We conducted trace-based evaluation in a realistic setting, we use video and sensor data of two events from the Jiku Mobile

Video dataset namely NAF 160312 and NAF 230312. Both events were music and dance performance on stage. Due to space constraints, only results for NAF 230312 are shown. We also conduct a phone test bed evaluation to understand CCMVA system performance in real network conditions.

Finally, we evaluate the subjective quality of CCMVA system through an user study to verify whether the gains in objective quality metrics translate to subjective quality improvements.

5. Conclusion

The focus of this paper is to verify how cloud computing can improve the transmission adaptability and prefetching for mobile users. We ignored the cost of encoding workload in the cloud while implementing the prototype. In this dissertation, CCMVA system, a novel system is presented which provides spatio-temporal coverage while minimizing the upload cost. The system uses sensor cues available in smart phones today to achieve the above goal. We can evaluate CCMVA through trace-based simulation driven by real-world dataset and energy traces, test bed evaluation and user study. Results can show that CCMVA algorithm which forms part of the CCMVA system system balances the trade-off between spatiotemporal coverage and energy much better than the other candidate algorithms and can provide results which can be close to the best available videos. As one important future work, we will carry out large-scale implementation and with serious consideration on energy and price cost. In the future, we will also try to improve the SNS-based prefetching, and security issues.

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