MoViShare: Building Location-Aware Mobile Social Networks For Video Sharing

Li Ma Zonggao Jia Jiangchuan Liu
School of Computing Science, Simon Fraser University
British Columbia, Canada
{lma8, zmj, jcliu}@cs.sfu.ca

***Abstract*—Social networking and content sharing are the two major reasons for the explosion of web 2.0 applications in recent years. Although more people enjoy Internet and multimedia via their cell phones, most of the services for online video sharing are still restricted to traditional PC users. The existing systems of mobile video sharing have yet to effectively explore mobility decently address the energy and bandwidth limitations of mobile devices. We propose MoViShare (Mobile Video Share), a universal video sharing platform that will provide anytime anywhere video browsing and publishing services for mobile devices. MoViShare targets to create and maintain location-aware mobile social networks, and to apply video abstraction technique for saving bandwidth and energy. We detail the MoViShare design in this demo, and demonstrate a prototype design based on the Nokia Symbian development kit and N96 smartphones.**

I. Introduction

Recent two years have witnessed the explosion of networked video sharing, e.g., YouTube, as a new killer Internet application. The great achievement lies in the combination of the content-rich videos and, equally or even more importantly, the establishment of a social network. The videos are no longer stand-alone units but are hyper-linked to each other based on their owners' social relationships, which highly motivate individuals' participation. It is interesting to point out that the clients of video sharing sites and that of advanced mobile devices are largely overlapped, with a majority of them belonging to the young generation. Unfortunately, most of the video sharing services are still restricted to traditional Internet users, even though more and more mobile devices are multimedia-ready. According to a recent report from Veeker Ltd., only about 50 percent of U.S. mobile phone subscribers with built-in cameras actually snap photos, not to mention videos. Only recently have we seen preliminary attempts that explore mobile video sharing, e.g., by YouTube and Veeker.

Comparing to PCs, iTouch and other mobile devices have weaker processors and smaller screen size. Most of them are also suffered from power limitations when watching videos. Comparing to wired network, mobile networks have much narrower bandwidth as compare to the broad-band Internet. Therefore, simply launching a mirror of the original video sharing site and opening existing sources to mobile users may not give satisfying services as expected.

Mobile-specific social networks like airG and MocoSpace have started attracting clients worldwide. These mobile social networking services emphasize the activities people tend to do on their phones, such as locating friends via GPS, and using camera phones and cellular data networks to data. Unfortunately, these systems are more focused on mobile-based communications or simple user-based social networks. Most of them have very limited location-wise considerations when building the mobile social networks. For those who make great efforts on the utilities of positioning components of mobile devices, they are not designed specifically for video sharing.

To fill the gaps, we design and develop MoViShare (Mobile Video Share), a universal video sharing platform that accommodates mobile accesses. MoViShare is targeting a seamless combination of location-based mobile social networking and mobile multimedia source sharing. The incorporation of mobile clients also enriches these sites, given that the video contents can now be captured and published anywhere anytime. More importantly, MoViShare will create and maintain location-aware social networks among the clients. It will explore their mobility by effectively utilizing the location information and activating context-sensitive location-aware video browsing and sharing. In addition, to address the issue of bandwidth and energy limitations of mobile devices, an video abstraction will be provided for every video clip, which only contains the key frames and can be displayed on normal web pages. The abstractions are representative and intuitive yet their lengths are only 1% to 5% of the original video clips.

II. MoViShare Hights

A. Location-Aware Social Network

Ideally, network users expect to share their videos or photos with others anytime anywhere. Instead of simply gathering video clips and streaming them to cell phones, service providers should target on building and maintaining a mobility aware social network among massive end users by effectively utilizing the location information. As such, clients can instantly retrieve nearby photos and videos, make new friends during trips, and share live experiences with old friends.

As Figure 1 shows, MoViShare will create and maintain location-aware social networks among the clients. It will explore the users' mobility by effectively utilizing the location information. Specifically, MoViShare will enable context-sensitive location-aware video browsing and sharing. A user can search for videos based on their current positions or

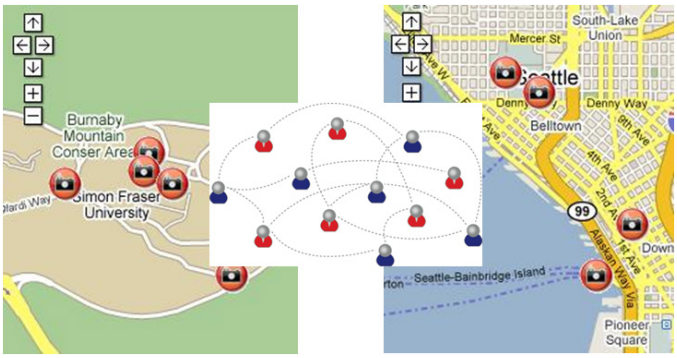

Fig. 1. Location aware Social Network

expected locations. Diverse social networking features can also be easily applied in the prototype we have built, such as locating a friend, communicating with others in the same event or party, sharing visualized location info to others, etc. This kind of services are unique in mobile devices, and will conveniently facilitate clients to interact with their environment and other users.

B. Video Abstraction

Another problem is that the mobile devices have limited battery power and restricted network bandwidth. Thus it is not reasonable to ask a mobile user to watch all the video clips in order to find the right one.

Using Video Abstraction, every video clip will be abstracted to a small GIF file, which contains only a few key frames and can be displayed on normal web pages. The length of abstraction files are normally only 1% to 5% of original video clips. Therefore, fast browsing and searching features on mobile devices can be activated.

Fig. 2. An example of Video Abstraction

By seeing the abstraction image, user can immediately get a global impression of that video; such as the mainly content, place of taken, protagonist of video, etc. Figure 2 displays a sample video abstraction by listing the key frames extracted from the source video clip, in which we can easily figure out the main content. With additional information provided by the system, such as the length, view times, rating and comments, user can make a much more informed decision of whether to watch the whole video. And further more, the video abstractions can be used by the notification system to promote video clips to selected user groups via emails or MMS messages.

MoViShare applies a sample-based technique by simply extracting key frames of the video (i.e. the I-frames) and merge them together as a .gif image. The reasons are as the following. First, we want to keep the process to be simple and fast when running on the server side. So a quick running algorithm is preferred in this case. Secondly, it is a simple but also reasonable solution because most of videos in such sharing systems are short and with single shot only. It is not necessary to apply shot-based, cluster-based or feature-based algorithms that cost much more processing time and development efforts while only work better for longer videos.

III. MoViShare Design and Implementation

A. System Design

The system consists of three major modules.

1) User Interface and Social Networking Module: This module will serve as a transparent middleware to intercept the requests, translate them, and then redirect users to the video sharing sites. It also plays an important role in creating and maintaining the mobile social network among the users and their friends.

2) Location Management Module: The location management module keeps track of the client location (through GPS or Wi-Fi access point's information). It can redirect a client to a site dedicated for the current location, or, with support from the video site, provide a list of related video clips sorted by a location-aware score. More importantly, it will work together with the social network module to promote location-aware medias to selected groups of users.

3) Video Abstraction and Streaming Module: The streaming module delivers video. While streaming has been realized in current mobile platforms, MoViShare will distinguish itself from existing solutions by exploring video popularity and correlations derived from social networks. Our experience with YouTube videos has shown that there are strong clustering behaviors among videos and users, thanks to social networks [1]. This offers great potentials for effective caching and pre-fetching of videos of interest. Video abstraction module generates the abstraction from large video files for users to glimpse.

Figure 3 only shows briefly the location-wise video display interface, which is directly shown on a map. Other interfaces including client side main interface, uploading video interface, video browsing and searching interface can be seen in our reference website.

Users upload the media files to the system to share to other users via MoViShare. At the mean time, working with the GPS

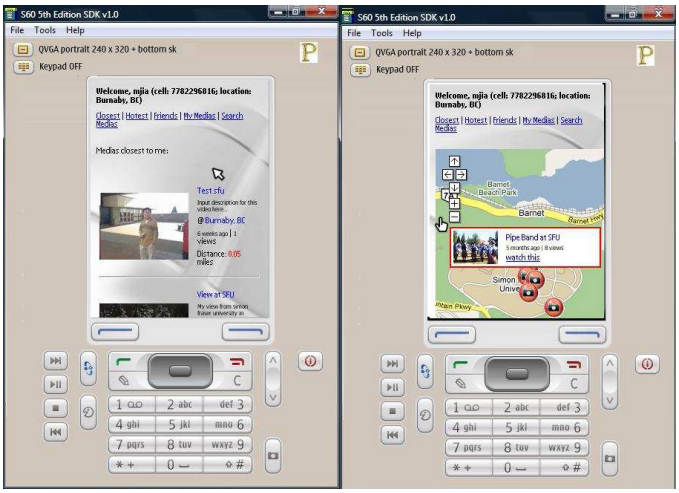

Fig. 3. MoViShare location-wise video display interface

hardware integrated in their mobile devices, the location information will be uploaded as well. Therefore, location-aware social network can be built with individual's presence, location and contextual information. Via location-wise social network, people can see where other users are, how far are they away from, or even a visualized location information by pictures or videos, together with other contextual information. Thus, they can further reveal nearby friends, places of interests, and potential friends with similar tastes.

MoViShare users may discover and then enjoy a new type of social networking experience, i.e. the real-time social activities via cell phone. In traditional social networking, time is an unhonored matter. For example, user A writes some comments on B's page to ask about a place B has been to or a movie B has watched, but B might not be able to reply to A instantly. By contraries, a location based mobile social network will let users communicate with others simultaneously during some events. For instance, users can invite somebody for a drink or a party, or chat up with someone in a bar or an event, while in a traditional way they might be shy or unconfident to talk to others.

B. Prototype Implementation

We have successfully built a MoViShare prototype based on the N96 smartphone with the Nokia Symbian S60 development platform.

We apply S60 Web Runtime technique [2] in the client side. The Web Runtime (WRT) extends the web browser for S60 to enable widgets and offers an optimized web experience that a user can access with a single click. On the server side, we adopt the Microsoft .Net2.0 as the framework. We also integrate other web developing technologies such as Javascript, Google Map API to make the interface more friendly and intuitive.

Given the nested-box structure of MPEG-4 files, our Video Abstraction implementation works on specified boxes and extract the key-frames. We obtain the sequence numbers of I-Fraems, which is in the Sync Sample Box ("stss"); then we retrieve the corresponding chunks in Chunk Offset Box ("stco") and the size from the Sample Size Box ("sts"). This way the consumed memory and the processing time are both minimized.

We then decode the MP4 frames to the YUV format, and covert the YUV stream to the BMP file, using an algorithm similar [3]. Finally we convert those BMP images into a single GIF file.

IV. Demonstration Scenario and Requirements

In the Demo setup, we will use two Wi-Fi enabled Nokia N96 cellphone to represent user A and B.

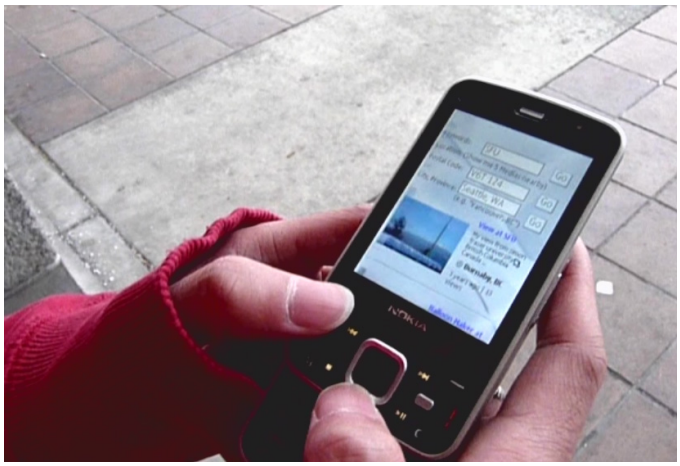

Fig. 4. snapshot of demonstration

User A can capture video clips anytime and anywhere. Then A uploads the video to the system to share to other users. Meanwhile, working with the GPS hardware integrated in the cell phone, A's location information (e.g., latitude and longitude values) will be uploaded as well. Another user B, a friend of A, might want to browse the videos uploaded, as Figure 4 shows. B can check what are the videos around the place where he currently is. He can also check what places A has been to and what videos have been uploaded, and give comments.

More demonstration scenarios and videos can be found at our MoViShare website:

http://www.cs.sfu.ca/~lma8/personal/newmovisharewebsite/movishare.html

In the demonstration, we will need:

- WLAN access point
- 2 tables, one for sever, the other one for cellphones
- Setup time: About 30 min.

References

[1] X. Cheng, C. Dale, and J. Liu, "Statistics and Social Network of YouTube Video." in *Proceedings of IEEE IWQoS*, 2008.
[2] S60Web Runtime (WRT). http://wiki.forum.nokia.com.
[3] Mayo. http://www.projectmayo.com.