MobiSNA: a Mobile Video Social Network Application (Demo Paper)

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ABSTRACT

This paper presents MobiSNA – a mobile video social networking application that supports the exploration, sharing, and creation of video contents through social networks. The MobiSNA project provides the user with an easy to use experience of accessing video content from mobile devices (e.g., mobile phones, PDAs) over wireless broadband networks (e.g., 4G networks). This demo focuses on the key functions of MobiSNA which support social network-based video exploration, real-time video sharing, video blogging, video interest groups, and video story construction. A system architecture of MobiSNA is also proposed.

Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems – *video.*

General Terms

Design, Human Factors, Social Networks, Mobile Devices

Keywords

Video social networks, mobile social networks, mobile video sharing, social networks

1. INTRODUCTION

Rapid developments in wireless broadband networks (e.g., 3G and 4G networks) and mobile devices challenge researchers and designers to offer users innovative applications for accessing rich information on the Internet. As 3G networks cover almost 97% of the population in the United State [1], network carriers plan to deploy 4G networks (e.g., LTE, WiMAX), which allow bandwidth above 100 Mbit/s. Mobile devices, such as cellular phones, have become more powerful with bigger and higher resolution displays, faster CPUs, and better network capabilities, making mobile devices a robust platform for information retrieval and sharing. At the same time, there is a surge of social network phenomena on the Internet and an increasing number are engaged in social network services which are starting to move to mobile devices [2][3][4][5].

To leverage the benefits of wireless broadband networks and powerful mobile devices, we propose MobiSNA, a mobile video social network application that enables a versatile new user experience for social networking and sharing of video content on the Internet. MobiSNA uses high-end mobile devices to build mobile video social networks where users can share videos, create personalized video content, and which facilitates virtual communities thorough video sharing.

In this paper, we will first describe the motivation behind our decision to develop MobiSNA as well as some general use-case scenarios. We will then describe the key functions of MobiSNA, including social-network-based video browsing, real-time mobile video sharing, video blogging, video-based virtual community, and video story compilation. Next we will introduce the system architecture and implementation. And finally, we discuss the contribution of the MobiSNA project and future work.

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2. RELATED WORK

Two categories of work involving mobile video social networking can be described as mobile social network services and mobile video delivering and sharing.

Mobile social network services build mobile communities which share and explore interests and activities with a mobile phone. Such mobile network services include JuiceCaster [2], MobShare [3] , Plog [4], etc. These applications, as discussed in [5], allow users to social network primarily by exchanging short messages, online chatting, sharing blogging, image and partially video with their mobile phone. However, these applications do not take full advantage of videos in terms of social networking since they use short message and text chatting as main approaches.

Another strand of applications and services mainly focuses on mobile video delivering and sharing, e.g. like Vuclip [6], Youtube Mobile [7], Mobile TV [8], etc. Some consider social factors when delivering video contents [9]. However, these applications lack interaction with users' social network. For example, when users are watching a friend's video clip, they do not have a sense of the social network of video clip's owner and what else can be shared.

Furthermore, both of these types of applications and services do not provide real-time video sharing with mobile devices because of limitations of the current application infrastructure. Also their interfaces are based on the web and fail to provide a rich user experience and interaction.

3. CONTRIBUTION/MOTIVATION

With the millions of videos being created, consumers are looking for easy to use, intuitive user interfaces. Our MobiSNA application allows us to demonstrate user case scenarios that could be eventually be supported by mobile broadband service providers.

The contribution of the MobiSNA is its enhancement of the user experience in accessing video contents with mobile devices on the wireless Internet. There have been three primary motivations for this project: first, we hope to establish an environment that enables users to share videos anytime and anywhere; second, we expect users to be able to easily discover videos of interest; third, we intend to enable users to define, collect, and compile videos in personalized ways for their own purposes.

To show the usefulness of our project, we discuss what we believe to be interesting scenarios. We have developed three user scenarios to highlight how MobiSNA can satisfy users needs: in Scenario 1, users share live videos at leisure with remote friends, In Scenario 2, a journalist shares videos with his/her colleague for work, in Scenario 3, we show the potential of the MobiSNA system by providing a more complete video report compared to that of the traditional media. Scenarios 1 and 2 exemplify our first motivation, video sharing, while scenario 3 exemplifies all three.

Scenario 1: A college student is counting down to 2010 on New Year's Eve on Times Square. He wants to share the exciting moment, live, with his girl friend, who is at the plaza of the Eiffel Tower at Paris. He calls her and they both use their video phones to feed live images to each other. Later, they invite their closest friend, who is in Tokyo, to join them. The three share real-time videos from three continents with their phones all at the same time.

Scenario 2: A TV station is attempting to cover an earthquake, which destroys roads and prevents the station from sending staff to "ground zero". However, when reporters (or citizen journalists) on "ground zero" call into the station and report the situation, the station manager decides to ask the reporters to send live video through their video phones. With live video feeds from different reporters, the station creates a better story on the earthquake.

Scenario 3: A CNN reporter wants to produce a story on the damages caused by Hurricane Hana. She searched video archives from various new stations, and found most of videos were shot after the hurricane had passed. To get more information, she conducted a search on the Internet and discovered an interest group of all members who have live videos captured with their video phones or camcorders on how the hurricane passed their areas and what happened at that moment. Some of members even have blogs to explain their footages. The reporter joins the group, browses the video collections of all members by her iPhone (she is always on the move), and finally produces an award-winning story on the development and consequences of the hurricane by compiling videos from the interest group.

The above scenarios could happen soon, given the fast pace of technology advancement in wireless networks and mobile phones. To support tasks seen in these scenarios, we need applications that allow mobile-phone users to explore, share, manage, select, and compile videos through social networks. Our MobiSNA project is aimed at exploring such a user interface design and system architecture that will support such tasks.

MobiSNA targets high-end mobile devices with wireless broadband networks. Such devices and networks we believe will be available in the near future. For example, one can already see mobile phones, such as Sony Ericsson XPERIA X1, or mobile platforms, such as NVIDIA Tegra [10], that are equipped with a processor over 500MHz and a screen resolution above 800 x 480. As for cellular networks, currently, at least four carriers in the United States – Sprint, AT&T, Verizon, and Alltel Wireless - provide broadband services. We believe that all these technologies make MobiSNA feasible in the near future.

4. KEY FUNCTIONS of MobiSNA

4.1 Video Social Network Exploration

This feature allows users to browse videos compiled from their social networks. Figure 1 shows the use of this tool by a user who is browsing presidential inauguration videos which she received from her friends.

Figure 1. Video exploration for "Obama inauguration".

The center space is reserved for playing the video she has chosen to view. Surrounding the center area are the additional videos that she has received from her friends. Each friend's video collection occupies a block.

To reduce the computation and network load, only the chosen video, which is played at the center, is streamed. All other videos are represented by their keyframes, which are extracted automatically based on corresponding videos (details of image extraction will be discussed in Section 4). By moving the cursor over a block, the user sees a quick playback of video keyframes. The user can also browse through a friend's video collection through a stack view (Figure 2).

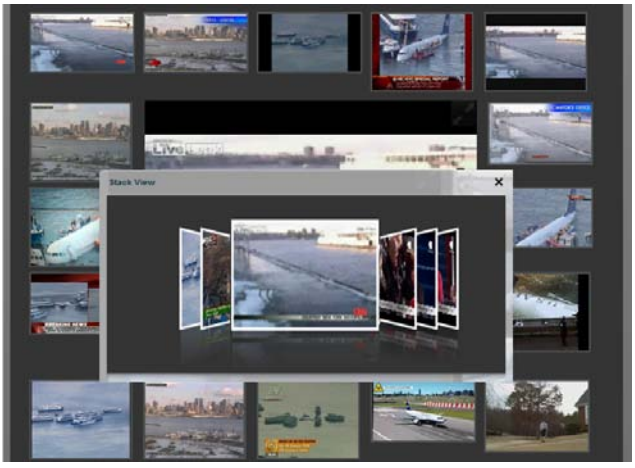

Figure 2. Browsing a friend's videos.

4.2 Real-Time Video Sharing

Real-time video sharing enables users to share live videos with distant friends or colleagues. The MobiSNA application allows users to invite friends or other users to join the real-time video

sharing. Figure 3 shows a scenario where five users are sharing live videos about a hurricane. At the center is a live video from one user and the tour other smaller views are live views from other users. Clicking any of the smaller views will bring it to the forefront.

Figure 3. Real-time video sharing for a hurricane.

4.3 Personalized Video Collection: Video Blogging, Video Interest Group, and Video Compilation.

The MobiSNA system provides several ways to discover a video of interest for the user and personalize a user's video collections, as illustrated in Figure 4.

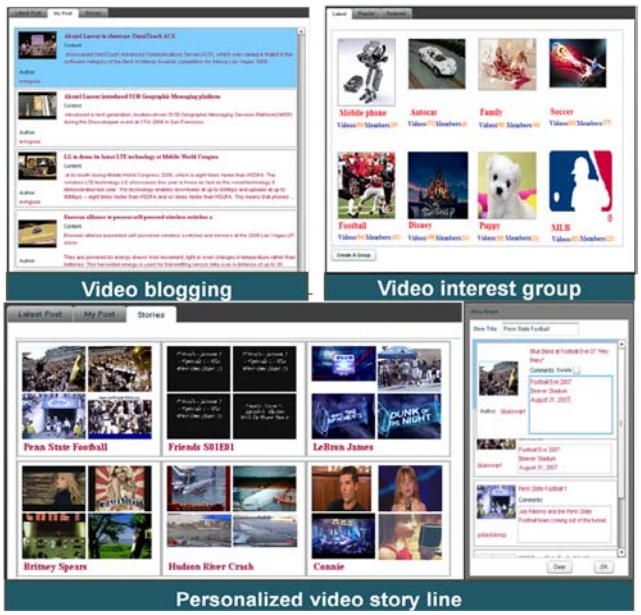

Figure 4. Personalizing video collections tools: video blogging, video group, and video story line.

Video blogging enables users to communicate with each other offline via videos. Users can create a new post and add the description or personal comments about videos. Other users can also leave their comments.

Video-based interest grouping offers users a tool to create social groups based on their common interests, such as automobiles, football, or cell phone products. Users can join or leave an existing group based on their interests. Once a user joins a group, the user can add new related videos to this group and watch other videos in the group.

A personalized story line allows users to compile videos from various sources into one coherent story. A user can grab videos from her own video library, from her friends' video collections, or from an online video interest group, or all of the above, and then create a story by a personal compilation of relevant videos.

5. IMPLEMENTATION OF MobiSNA

5.1 MobiSNA System Architecture

MobiSNA is based on a client-server architecture (Figure 5).

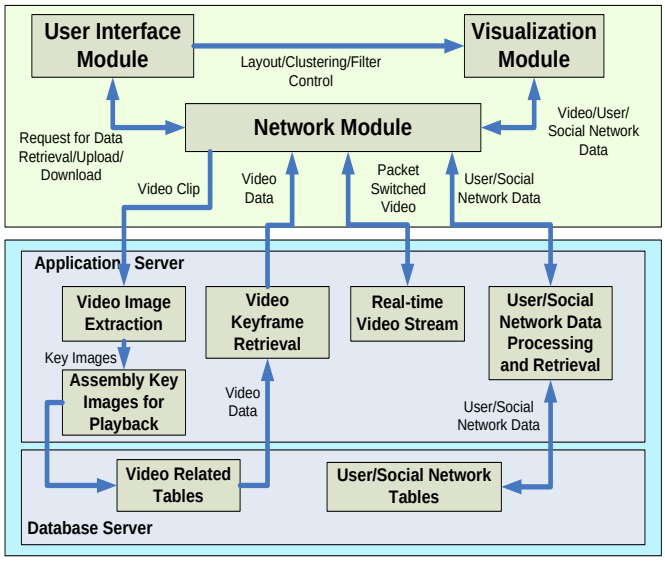

Figure 5. MobiSNA System Architecture.

5.1.1 The MobiSNA Client

In our system, each client is run on a mobile device equipped with a camera. Thus, users are able to share real-time videos with friends. A MobiSNA client includes the following three components:

- ***User Interface Module*** is responsible for interaction between users and the mobile devices. It receives the request from users and sends the commands to corresponding modules.
- ***Visualization Module*** is responsible for displaying different layouts under different scenarios. It follows the requests from the *user interface module* and interacts with the *network module* to exhibit the videos or other functionalities provided by MobiSNA.
- ***Network Module*** follows the data retrieval/upload commands from the *user interface module* and interacts with server to complete the tasks. It receives videos, video information, and social network information from server and passes them to the *visualization module*.

5.1.2 The MobiSNA Server

The MobiSNA server consists of the application server and data server. The application server has the five components:

- ***Video Image Extraction Module*** utilizes open source software, FFmpeg [13], to extract the key frames of an uploading video. FFmpeg includes libavcodec, the leading audio/video codec library, in order to deal with various types of up-to-date audio/video formats.
- ***Key Image Assembling Module*** receives the key frames from the *video image extraction module* and employs open source software, ImageMagick [16], to generate the animated images.
- ***Video Keyframe Retrieval Module*** provides keyframes of those videos that are retrieved and not played by users.
- ***Real-Time Video Stream Module*** is responsible for streaming videos, either in the single user exploration mode or the peer-to-peer sharing mode. This module is built upon the Adobe Flash Media Server 3.5 [15], which delivers VOD (Video on Demand) and live video streams, and Adobe Stratus [14].
- ***User/Social Network Data Processing and Retrieval Module*** offers social network data to users based on users' profiles and friend lists. This module was built based on the Elgg platform [12].

The data server consists of the following two components:

- ***Video Related Tables*** stores the information of the videos. Based on information about the owner of the video, *video related tables* can cooperate with the *user/social network tables*.
- ***User/Social Network Tables*** store users' profiles and information about social network and uses part of the database schema from the Elgg platform [12].

5.2 Implementation of MobiSNA

The client was developed with the Adobe Flex technology. Adobe Flex is one of the best Rich Internet Application (RIA) technologies currently available. It offers users web interface applications with rich user experiences similar to desktop applications. Moreover, users can expect the same user experience on different mobile devices, as long as the mobile device supports Flash.

The MobiSNA server is a LAMP (Linux, Apache, MySQL, and PHP) based machine and is integrated with other open source software as discussed above. Data services to support the access to MySQL database were built upon Above Flex BlazeDS [11], which provides remote object services and message services in Java and enables the Flex applications to access Java objects deployed in such application servers as Apache, WebSphere, WebLogic, etc.

6. DISCUSSION

We introduced a mobile video social networking application, MobiSNA, which supports video social network exploration, real-time video sharing, and personalized video collections (video blogging, video interest group, and video story lining). Based on aclient-server architecture, MobiSNA offers flexibility in delivering on-demand videos to thin-client mobile phones and leaves complex tasks to video data processing high-end servers.

There are several potential implications of MobiSNA. For leisure, it could offer a new social network fashion. Users can expand their social network from related text, pictures, and videos. Professionally, MobiSNA provides a new approach for people to communicate in situations such as emergency management.

MobiSNA can be improved in several ways. First, one can explore the integration of MobiSNA with existing social network services, such as Facebook and LinkedIn. Second, the functions of MobiSNA also can be enhanced with location-based services. With location information of mobile devices, MobiSNA can deliver video content based on users' location. Finally, MobiSNA can be designed with applications in mind such as health informatics, giving new insights into domain applications.

7. ACKNOWLEDGEMENTS

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8. REFERENCES

[1] CostQuest Associates**.** U.S. 3G Mobile Wireless Broadband Competition Report, 2008. Retrieved from http://costquest.com/costquest/docs/CostQuest_3G_Competition_Report.pdf on April 12, 2009

[2] Juice Wireless Inc. http://www.juicecaster.com/

[3] Sarvas, R., Viikari, M., Pesonen, J., and Nevanlinna, H. 2004. MobShare: controlled and immediate sharing of mobile images. In Proceedings of the 12th Annual ACM international Conference on Multimedia (New York, NY, USA, October 10 - 16, 2004).

[4] Gossweiler, R., and Tyler, J. Plog: Easily Create Digital Picture Stories through Cell Phone Cameras. In Proc. IWUC 2004, INSTICC Press (2004), 94-103.

[5] Lai, Chih-Hui. Understanding the Design of Mobile Social Networking: The Example of EzMoBo in Taiwan. M/C Journal 10 (1), 2007.

[6] XinLab Inc. http://www.vuclip.com/

[7] Hyland,T., Desai, D. 2008. Mobile Video Improvements to Enhance Mobile Social Networks. Position Paper for W3C Workshop on the Future of Social Networking.

[8] Stockbridge, L. (2006) Mobile TV: Experience of the UK Vodafone and Sky service. In Proceedings of EuroITV, 2006, Athens, Greece.

[9] Marcus, A. and A. Perez, m-YouTube Mobile UI: Video Selection Based on Social Influence, in Human-Computer Interaction. HCI Intelligent Multimodal Interaction Environments. 2007. p. 926-932.

[10] NVIDIA Corp. http://www.nvidia.com/page/handheld.html

[11] Flex BlazeDS. http://opensource.adobe.com/wiki/display/blazeds/BlazeDS/

[12] Elgg. http://elgg.org/

[13] FFmpeg. http://ffmpeg.mplayerhq.hu/

[14] Adobe Stratus. http://labs.adobe.com/technologies/stratus

[15] Adobe Flashmediaserver. http://www.adobe.com/products/flashmediaserver/

[16] Imagemagick. http://www.imagemagick.org/