MobiSNA:  
A Mobile Video Social Network Application  

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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 by taking advantage of the benefits of wireless broadband networks, powerful mobile devices and social networking phenomena. The MobiSNA project proposes to provide 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). We propose a preliminary architecture and interface design for MobiSNA. The interface demo of use 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. The architecture of MobiSNA system is also proposed.
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 States [1], network carriers plan to deploy 4G networks (e.g., LTE, WiMAX), which allow bandwidth above 10 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 of users 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 the MobiSNA project [6], 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 through video sharing.

We will first describe the motivation behind the development of 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 progress of the MobiSNA project and future work.

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 [7], Youtube Mobile [8], Mobile TV [9], etc. Some consider social factors when delivering video contents [10]. 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. MOTIVATION

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

The MobiSNA project is focused on enhancing user experiences in accessing video content with mobile devices using wireless Internet. Our three primary motivations for this project are: 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 [11], 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

In this section, we introduce the proposed functions of MobiSNA with the proposed user interfaces and interactions presented in detail.

4.1 Main Interface

The main interface of MobiSNA is show in Figure 1. The main interface consists of four parts: (1) Video network view panel, showing the video network collection with center an actual video and the surrounding videos static snapshots; (2) Search panel, accepting users’ key words to search videos of interest; (3) View tools, including showing visit history, story board to compile personal videos and
network view help users navigate in their social network; (4) Function control toolbar, switching to other functions, such as video chat (real-time video sharing), video blogging and interest groups. The interface indicates four major functions: video social network exploration, real-time video sharing, video blogging and video interest group and a special function for personal video compilation-story board. The details of each component are presented in following sections.

4.2 Video Social Network Exploration
Video social network exploration function is the primary feature of MobiSNA. The design rationale of this function is to present users’ social network by video collection and enhance the users’ awareness of social networking. This function stimulates users to explore and expand their social network with a playing and fun way of video exploration. The major interactions in this function include: playing control, quick playback, stack view, playing and exploration, check friends’ information, visit history, network view navigation and search.

4.2.1 Video Network
This feature allows users to browse videos compiled from their social networks. Figure 2 shows the use of this tool by a user who is browsing presidential inauguration videos which she received from her friends. The center space (Figure 2 (1)) is reserved for playing the video she has chosen to view. Surrounding the center area (Figure 2 (2)) are the additional videos that she has received from her friends. Each friend’s video collection occupies a block. Besides, we reserve the right bottom block for commercial (Figure 2 (3)), which is relevant to the video users are currently playing. To reduce the computation and network load, only the chosen video, which is played at the center, is streamed, and the surrounding videos from friends are represented by animated pictures.
Users are allowed to control the video played in the center by various tools. The video control tools include playing, pause, progress bar, volume control bar, and full screen button (located at right upper corner of the player).

When the cursor is over the current playing or surrounding video clips, the video details are popped up, shown in Figure 2(4). The video information include the title, the user name, taggs, and ratings from others.

4.2.2 Quick Playback
Quick playback function enables users have a glance of the content of surrounding videos from the friends of the current user. The quick playback is activated when the cursor is hovered over the image of the surrounding videos. The quick playback is implemented by playing animated key frames extracted automatically based on corresponding videos (details of image extraction will be discussed in Section 4).

4.2.3 Stack View of Video Collection
The user can also browse through a friend’s video collection through a stack view (Figure 2(1)). The stack view is enabled by two approaches: first, just single click on one of surrounding friend users may be interested in; second, click the stack view button located at left bottom of the center player (Figure 2(2)). This function is useful when a friend of the current user has more than one video clip. The stack view enable users smoothly go through the video collection by flipping book pages. After double clicking the selected video clip in stack view, the selected video will be played in the center place.

4.2.4 Playing and Exploring
When users are going to play one of the surrounding videos, they have two choices: playing and exploring. The Playing mode plays one surrounding video of interest but keeps the center of social network unchanged by double clicking on the surrounding video. In contrast, the exploring mode moves the friend of the surrounding video of interest into the center of social network by dragging it into center location, as shown in Figure 4. After dragging, the center of the social network is changed, and the friends of current users of interest are pulled out and placed into the surrounding blocks. The view of video social network is changed. By doing this, users can explore their whole social network.

4.2.5 Check Friend’s Information
Users are allowed to check on the information of their friends or other users by click the “Check User Info” button located at the right bottom corner of the center player, shown in Figure 5(1). With a smoothly animated transition, the user information panel is highlighted as shown in Figure 5 (2), which includes the profile picture, user name, location, hobby, brief introduction and joining time.

Figure 4: Exploring social network by dragging.
Figure 3: Browsing a friend’s videos by stack view. (1) Stack view (2) Stack view button located at the left bottom corner of center player.
4.2.6 Visit History

One problem is that users may want to go back to one previous friend they previously visited, but the current network view only shows the current friends. The function visit history is designed to solve this issue. By clicking the “Visit History” button, the visit history panel is appears in the floating current canvas (Figure 6). Users can go back the previous friend’s network by double clicking the item in the visit history list. Also users can clear the history list and hide the panel by clicking the “Clear” and “Hide” buttons.

4.2.7 Network View Navigation

To enhance the users’ awareness of social networking when they are using MobiSNA, an explicit network view is designed, as shown in Figure 7. The video network view discussed in section 3.2.1 and Figure 2 only shows the first degree friends (direct friends) of the current user. However, the video network view lacks of a broad and holistic view of the current user’s social network. And therefore, the Network View function shows the network of two degree friends (friends’ friends) and even more. This view facilitates users navigate in their social network by clicking the node in this view to put into the center place of video network view in Figure 2.

4.2.8 Search Video

In MobiSNA, users can issue key words to search video clips of specific topics. Figure 8 shows the search results of key word “Leborn”, and the current playing clip is the first result returned by server. The advertisement block at right bottom is also relevant to the key words users fired. The videos are indexed and searched by the meta-data such as title, tags and users’ comments, which is discussed in section 4.

4.3 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 online friends or other users to join the real-time video sharing. Figure 9 (2). Figure 9 (1) 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. Double clicking any of the smaller views will bring it to the forefront.

![Figure 9: (1) Real-time video sharing for a hurricane; (2) Invite an online friend.](image)

### 4.4 Video Blogging

The MobiSNA provides users write blogs along with videos. The video blogs can vividly record users’ life, work, and family and so on. Video blogging enables users to communicate with each other offline via videos. Because mobile users can update their blogs with video ubiquitously, MobiSNA enable people to keep in touch closely. Figure 10 shows the video blog list interface, which includes the lasted blogs posted by your friends (Figure 10 (1)) and your blog posts (Figure 10 (2)). Double clicking one video blog entry, the video will be played in the center place of video network view discussed in section 3.2.1. Enabling the edit mode in “my post” panel, users can modify the title, tags, and comments and even delete the selected video blog.

![Figure 10: Video Blog List. (1) Latest blog posts; (2) My blogs-edit mode.](image)

Users can create a new video blog by uploading a video clip stored in the devices along with description or personal comments about videos. Once the video is uploaded to sever, the server will automatically extract the key frames and make quick playback images for future uses (discussed in section 4). They may add some tags, and location information in the blog (Figure 11). Other users can also leave their comments about friends’ blog entry.

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

![Figure 11: Write a new video blog.](image)
online video interest group, or all of the above, and then create a story by a personal compilation of relevant videos.

4.5 Video Interest Group
Video-based interest grouping offers users a tool to create social groups based on their common interests, e.g., automobiles, football, or cell phone products (Figure 12). Figure 12 shows the video interest group interface, which includes the lately created groups and your interest groups. Items in groups list show the theme, name of groups, and the number of videos and members in groups. When clicking on the item of group list, the details of the group will popped up and show the members and video collection of this group (Figure 13).

Users can search, 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. Also users can create a new group and invite your friends to join in this group (Figure 14).

4.6 Story Board
The Story Board 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.

4.6.1 View Story
Figure 15(1) shows the story list. Each story item has some thumbnails of the contents and the title. When users click on a story, a story details view is popped up to show the contents of the story, as shown in Figure 15 (2).

4.6.2 Create Video
There are two ways to create a new story: create a story from video network, and create a story from video blogs. When creating a story from video network, users can activate story board by clicking “Story Board” button in video network view, and then drag any video clips of interest into the story board (Figure 16). Usually, users may collect video clips based on search results.

Users can also create a story from video blogs. In the story list view, shown in Figure 15(1), users can activate story board by clicking on the “Story Board” button located at the left bottom. By dragging and dropping blog posts into the story board (Figure 16), users can easily create a new story.
After collecting video clips in story board, users can edit this story line by giving a story title, adding personal comments, switching the order of the video clips by dragging and dropping them, and deleting them (Figure 17).

5. IMPLEMENTATION OF MobiSNA

In this section, we will introduce the system architecture and the implementation of MobiSNA.

5.1 MobiSNA System Architecture

MobiSNA is based on a client-server architecture (Figure 18).

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 [14], 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 [17], 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 [16], which delivers VOD (Video on Demand) and live video streams, and Adobe Stratus Error! Reference source not found.

- **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 [13].

The data server consists of the following two components:

- **Video Related Tables** stores the related information of the videos, such as basic video table, key frame, and dynamic image information. 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, information about social network and interest groups by using part of the database schema from the Elgg platform [13].

Figure 19 shows a part of the database schema related to the two components.

![Figure19: Database Schema.](image)

### 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 [12], 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

Here, 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 a client-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. In addition, implemented with the state-of-art RIA techniques, MobiSNA allows consistent user experiences across different mobile platforms.

The goal of the MobiSNA system goes beyond merely video contents delivering, and it enables video discovering and exploration based on personal social networks. The social network based video exploration offers users a serendipitous journey of all video collections from their friends, and friends of friends. It also facilitates social networking with mobile videos. Users can have enhanced awareness of their social networks when exploring video clips within social networks, and make new friends by perceiving and sharing other video collections. At the same time, strength of social ties can be enhanced through video sharing.

There are several potential impacts of MobiSNA. From the leisure perspective, it offers a new social network fashion. Users can expand their social network not only from regular social activities, but also based on text, pictures, and even videos. From the professional perspective, MobiSNA provides a new approach for people to communicate and adds value 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.

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8. REFERENCES


