Personal Network Aggregation System for Real-time Communication Support

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Abstract

In this paper we propose a system that aggregates together user's multiple personal networks, constructs a personal network that unifies their data and as well as adding activity information for each user inside the unified personal network. The system also allows transmission of user data within one's own personal network using P2P. This makes unification of use of multiple personal networks possible. Furthermore, this also allows other user's information to be fully understood, greatly helping the process of communication.

Keywords

real-time communication support, personal network, aggregation, P2P.

1. Introduction

In recent years systems that use personal networks, placing the individual at the center of a network of human relationships, have been on the increase, from the phone book inside one's mobile phone, to the contact list for one's instant messenger (hereafter 'IM') and social networking services (hereafter 'SNS'). In accordance with the increase in the number of these systems, the number of personal networks each individual holds is also increasing. However, regardless of the fact that the personal networks created in these systems often share the same human relationships they are generally individual entities with no interconnection between them. This means that an individual must select and use a system that suits their needs and as well as the people with whom they want to communicate.

Furthermore, because information pertaining to the user exists within each system it is extremely difficult to get an overall grasp of one's own personal network and user information. Thus, we propose a system that aggregates together user's multiple personal networks, constructing a unified personal network that brings together all shared elements. In this system activity, information for each user within the unified personal network is also provided, such as Blog entries or IM chat logs. Addition of this activity information means that the period in which each user operates can be determined, greatly aiding communication. However, this was simply aggregating Blog entries and other information pertaining to other users that the user could themselves gather. This created problems when it came to detailed user information and real-time information. Therefore, in this paper we also propose a system equipped with a function to aggregate activity information pertaining directly to the user and then share this with other users within the individual personal networks. This function allows an active unification of multiple personal networks, rather than relying on a lengthy process of manual unification. Furthermore, this also allows a total grasp of the current status and past status of other users, greatly facilitating communication.

A great deal of research has been carried out into a system that will support smooth communication through user activity information[3][4]. However, generally these conventional systems are only able to operate within specific communities, rather than making use of specific user activity information. Furthermore, whilst they generally offer information on the user's current status they do not offer anything concerning their past actions. Our system differs from these others in that it unifies and uses all of the personal networks that the user currently holds, making it highly versatile. In addition, it supplies both present and past information for each user, and by comparison of this information smoother communication should be enabled.

2. Proposed system

2.1 System composition

The composition of our system is shown in Fig.1.

Our system is an aggregation system intended to allow smoother communication by transmission of user information from acquaintances that provides an outline of their routine. Our system is comprised of a user information collection function and a P2P transfer function. The system then displays information pertaining to self and others aggregated by these two functions via an information display interface. Our system also operates on the local machine, and all user information obtained is saved as a local file using SQLite, employing a RDBMS. The user information saved as a local file is the user's personal networks, user's activity information and received activity information from other users.

The user information collection function performs activity information aggregating across personal networks that the user holds. The two types of data specified above that this function collects must first fulfill some basic selection criteria.

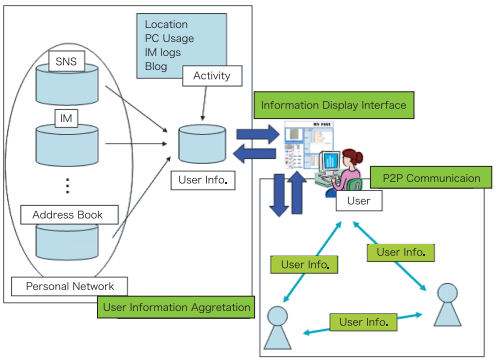

Fig. 1: *System composition diagram*

The selection criteria and aggregating process is detailed in 2.2 below.

The P2P transfer function can unify users who appear in multiple personal networks from which aggregating has been performed. Furthermore, it can also transmit and receive activity information with other users. Further details can be found in 2.3 below.

The user information aggregated by these two functions is all saved as a local file and can be viewed through information display interface. By using this interface the status of one's own personal networks and the others within them can be viewed. See 3 below for further details.

2.2 Aggregating user information

As explained above, our system aggregates information belonging to each user. There are two types of information aggregated, the personal networks that the user already holds and the activity information that belongs to the user. The details of each follow.

2.2.1 Aggregating personal networks

The personal networks used by our system must be a human relationships network based around the user. They must also fulfill the following other criteria.

In each personal network that information is aggregated from, each user must: (1) Have a unique ID. (2) Have a name or photo that allows who the user actually is to be determined.

If these conditions are met, and information can actually be aggregated from it, then that personal network can be used as a source of information. Even if condition (1) is not met it can be used as an own personal network source. However, it cannot be used in the active unification of personal networks via P2P transfer. The details of unification of personal networks via P2P transfer will follow below.

There are three types of personal network sources currently used by our system: the SNS (1) mixi[2], the IM (2) Windows Live Messenger[1] and (3) address book inside a mobile phone. The following is an explanation of the method of aggregating data from each of sources.

(1) Mixi

Mixi displays a user's personal network, called a "MyMixi", on a specific website. The HTML source data for this web page is acquired and through analysis of it, the user's personal network is acquired. Three types of information are obtained: unique ID, picture and name.

(2) Windows Live Messenger

The user data for Windows Live Messenger is saved on the Messenger servers. By using the user's account data to connect to these servers the data for the connected user can be obtained. By analyzing the obtained data the user's personal network is acquired. Two types of information are obtained: unique ID and name.

(3) Mobile phone internal address book

Many of the address books stored inside a mobile terminal are in the vCard format. vCard is a format used to handle name data. In vCard the data for each individual is stored between the brackets [BEGIN:VCARD] and [END:VCARD], in the format of [Category : Value]. Our system saves the internal address book as a vCard file on the calculator, and by analyzing this vCard file the personal network is acquired. Three types of information are obtained: unique ID, name and picture.

The personal networks aggregated from the above three sources are all saved as local files using SQLite.

2.2.2 Aggregating activity information

The user activity information used by our system must fulfill the criteria that the information has an acquisition time. If this condition is fulfilled, and the information can be obtained, then that information can be used as a source of user activity information.

Currently our system uses four types of user activity information: (1) location, (2) PC usage information, (3) Blog log and (4) IM chat log. The details of these four types of information are as follows.

(1) Location

Location data is obtained using the positional location system EIRIS installed in the buildings belonging to the research departments to which we, the authors, belong. Each user has a badge (Fig.2(B)) that transmits an infrared signal every four seconds that includes a unique ID. This signal is received by readers (Fig.2(A)) places on the ceiling of the rooms and corridors, and the position of the readers and unique IDs allows the location of the individual to be ascertained.

(A) Reader (B) Badge

Fig. 2: *EIRIS system*

The readers are positioned as shown in Fig3. The double circles indicate where readers are placed. There are approximately 120 readers placed throughout the research block.

The information obtained is sent periodically to the EIRIS servers where it is saved. Then, if the user whose position has been found is using our proposed system the information obtained from EIRIS can be sent to all users. From EIRIS the time and location are acquired.

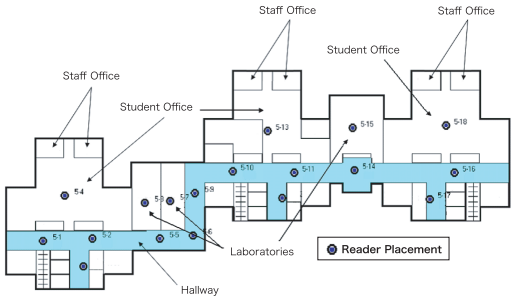

Fig. 3: *Example of reader placement*

(2) PC usage information

In order to obtain PC usage information a special background application for windows is used. The information obtained is the name of currently active applications and Web URLs that have been viewed and the acquisition time for each. Furthermore, both mouse and keyboard usage are acquired, and if neither are used for a certain period of time, the PC is deemed as not being used.

(3) Blog

Blog as used in this paper refers to information such a diary that a user maintains individually on the Web. Our system aggregates information from Blog entries that transmit RSS and from the Blog in the SNS Mixi as outlined in section 2.2.1. The RSS is the base format of XML, which creates meta data such as Web site headings and summaries. By analyzing this RSS Blog information can be acquired. From these two types of Blog, the Blog content and date of alteration can be acquired.

(4) IM chat log

For Windows Live Messenger the chat log is stored as an XML file for each individual acquaintance within the user's own PC. The content of each file obtained from the chats is analyzed and the chat content and date of the chat is obtained.

The four types of activity information obtained are saved as local files using SQLite. As the activity information is updated frequently, it is necessary to save it actively.

(1) and (2) are actively saved as local file info, but a trigger is required for the information for (3) and (4) to be checked. Our system therefore periodically acquires this information and saves the acquired activity data as a local file using SQLite.

Each piece of activity information has to be divided into one of two types: (1) Information that contains communication (2) Information that does not contain communication Of the above four types of activity information (1), (2) and (3) are user's individual activity data that contains no communication. As (4) is related to chat that means there is always a second person involved, and thus this information contains communication.

2.3 Transmission of user information via P2P communication

Our system transmits user information, based upon the user information it aggregates, to other users via P2P. The individuals to whom this user information is sent are other users in one's own personal network. There are two types of user information transmitted via P2P, (a) one's own profile information and (b) activity information. The following are the details for each type of information.

(a) Profile information

Transmits a unique ID from the personal network source as the user's own profile information. By receiving unique ID from other users any multiple occurrences of the same person across personal networks begin to become unified.

(b) Activity information

Activity information sends information that only the user themselves has, and no other user could otherwise gain access to. Regarding the activity information used by our system, the above detailed (1) location and (2) PS use status relate to the users current physical situation. Other users are also able to obtain (3) Blog log, therefore only the information required in order to acquire information like (3) is sent. Information like (4) contains communication with a third party and will thus not be sent.

Transmission of these two types of information will only be performed whilst the user is using our system, with the information being resent if it changes. Information received from other users is all saved as local files using SQLite.

3. Information display interface

3.1 Main interface

The main interface which displays the aggregated data is shown in Fig.4. The main interface displays user information for each use in the personal network, (Fig.4(1)), all users activity information history (Fig.4(2)), specific user's detailed information (Fig.4(3)) and own activity information history (Fig.4(4)). All the user's activity information displays other user's activity information in chronological order, both user activity information received via P2P transfer and activity information collected by oneself. Three types of information are displayed: time required, overview of activity information and user's name. In addition, one's own activity information history is displayed in chronological order, created from data taken from local files. Two types of information are displayed: time acquired and overview of activity information. Details of Fig.4(1), the personal network display, and Fig.4(3), the user's detailed information display, are given below.

3.2 Personal network display

Fig.5 shows the display of the unified personal network. This display shows three types of information aggregated from the personal network sources: each user's picture, name and an icon displaying the source network (Fig.5(1)).

Fig. 4: *Main interface*

The following two types of information are also displayed: (1) Information on when each user's activity information was renewed last. (2) Information on when each user was communicated with.

These two types of data are displayed using bars (Fig.5(2)). The less white is showing in the bar, and the more of another color, the newer the information displayed is. Furthermore clicking the icon by this bar will switch it from (1) to (2) or (2) back to (1). These bars not only make clear the activity level of each user, but also the degree of communication taken with them.

Fig. 5: *Personal network display*

3.3 User's detailed information

Fig.6 shows the display of user's detailed information. This display shows the three types of information from the previous section (picture, name, icon), along with the two types of bar, activity core time (Fig.6(1)), details on current activity information (Fig.6(2)) and activity information history (Fig.6(3)), a total of seven different types of information.

The activity core time is a bar that displays the time in

Fig. 6: *Detailed information display*

which that user is especially active, taken from when activities have overlapped in the total past activity information history. For example, if there are two IM chat histories, one from 17:05-17:25 and one from 17:03-17:18, the section of the bar representing the overlapping period 17:05-17:18 would change from white to another color. Each color on the bar represents each type of activity information. This bar allows one to quickly see at what times a user is generally performing what activities. The details of current activity information displays the latest activity information received from P2P and details of it. If the user is not using the system then " system not in use " is displayed. The activity information history displays the user's activity history in chronological order, taken from the saved local files.

4. Conclusion

This paper has proposed a system that aggregates activity information from personal networks comprised of other systems and personal information that only the user has access to, and uses P2P to unify these personal networks and obtained activity information on other users. Through the use of this system, one cannot only grasp what another user is currently doing but also what they have done in the past. This kind of user information should help a great deal in support real time communication.

The proposed system has no limitations on the transmission of user information. Thus, using the system means information will be actively transmitted to other parties, and this could raise privacy issues. Therefore, our next goal is to implement a feature that allows the user to set limits on the amount of the information transmitted. We also intend to provide a tool for actual communication, using the user data obtained by this system.

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