Study on Public User Interface

Atsushi Hiyama, Kotaro Hashimoto, Tomohiro Tanikawa, and Michitaka Hirose

Department of Mechano-Informatics,
Graduate School of Information Science and Technology,
The University of Tokyo,
7-3-1, Hongo, Bunkyo-ku, Tokyo, Japan
{atsushi, kotaro, tani, hirose}@cyber.t.u-tokyo.ac.jp

Abstract. In this paper, we describe life-log content mash-up application called "Sharelog" by using widespread consumer mobile device. By using consumer mobile device as a interface for ubiquitous and mobile computing application, the system developers are enabled to focus on the content side of an application. We have demonstrated our application "Sharelog" at the museum exhibition and realized the capability of consumer mobile device as an interface for ubiquitous computing in public space. We would like to call this kind of mobile devices as public user interface.

Keywords: mobile device, ubiquitous computing, human interface, mash-ups.

1 Introduction

The number of personal mobile devices such as cellular phones, music players, game machines and digital cameras are dramatically increasing according to the price-reduction and downsizing of computer devices. It might be easy to develop a system which can be accessed by the general public if we can design a system which is promised on the widespread use of such mobile devices. This attempt is quite different from existing ubiquitous and mobile computing developments that are focused on designing mobile devices and system infrastructure. Considering above mentioned background, we discuss on the characteristics and issues in designing information systems based on ready-prevalent mobile devices as user interface. We may call this kind of interface as public user interface.

1.1 Growing Popularity of Consumer Mobile Devices

Cellular phones are the most common mobile device. In June 2006, contracted quantities of cellular phones are 93,000,000 in Japan. The Japanese population is about 120,000,000. Therefore, almost every Japanese people carry a cellular phone.

Mobile music players for mp3 format music files are rapidly spread worldwide in recent years by the release of Apple Inc. iPod (Figure 1). 184,600,000 mobile music players are manufactured in 2006 and it was 36% increase from 2005. In Japan, 6,000,000 mobile music players are sold and it was 328.6% increase from previous year.

M.J. Smith, G. Salvendy (Eds.): Human Interface, Part II, HCII 2007, LNCS 4558, pp. 518–525, 2007.

Fig. 1. Apple iPod [1]

Nintendo DS is a mobile game machine released in December 2004 (Figure 2). It has double screen and touch panel interface. It also has wireless communication interface and speech recognition functions. Various kinds of game software using these characteristics are already produced.

Fig. 2. Nintendo DS [2]

Electronic money is one of the rapidly widespreding mobile devices. Felica is an IC card system developed by sony. Felica system is based on noncontact interface and it is a de-fact standard of electric money in Japan.

1.2 System Designing in Web2.0

Web2.0 applications were realized by utilizing networked PCs as a new foundation of information systems. Picture sharing web site Flickr[3] or movie sharing web site

YouTube[4] are representatives of Web2.0 web applications. Developers of these web sites are only providing a place where general public users can share their contents and they do not make application contents by their selves. This type of system developments have new methodology that developers also do not need to deal with fundamental system architecture development.

2 New System Design Methodology in Ubiquitous Computing

Existing system development in ubiquitous and mobile computing is mainly focused on constructing system architecture and not much pay attention to mass user participation in general public. On the contrary, recent system development researches in this field are beginning to consider mass participation of general public as an implementation method such as Place Engine[5] or The ESP Game[6][7].

Conventional ubiquitous and mobile computing researches are focused on two objectives. One is to cover wider range of physical space where we can provide information services and the other is to personalize those information services in efficient way[8][9]. In addition to these two grouping axis, we bring up another grouping axis of degree of mass participation of general public. Resent research examples can be mapped in this three dimensional space as shown in figure 3.

System development examples in domain (A) are based on new system designing methodology. I can be said that the applications which will be mapped in domain (B) are the ideal realization of ubiquitous and mobile computing application.

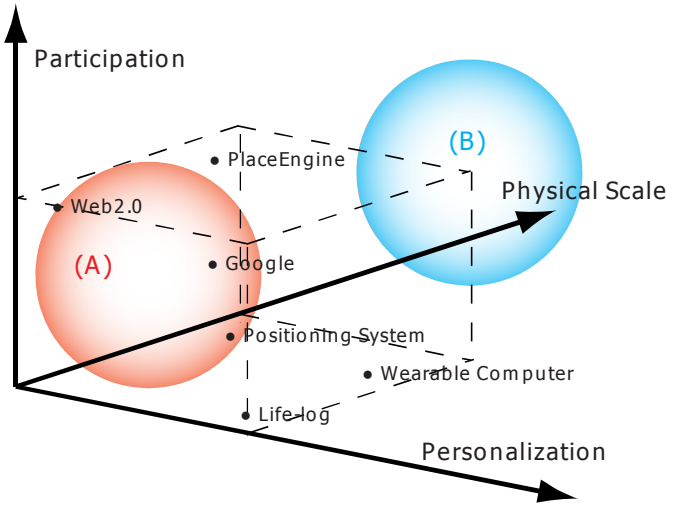

Fig. 3. Classification of System Developments in Ubiquitous Computing Field

3 Content Mash-Up Application

3.1 Electronic Money Card "Suica" as Ubiquitous Mobile Device

Requirements for the mobile device in our application are,

1. device must be widely used
2. device can carry an individual usage history
3. device can obtain position related data
4. device can be used as a input/output interface in the system

By considering above requirements, we chose electronic money card "Suica", which is mainly used as an IC card type train ticket in Japan (Figure 4).

Since 14,000,000 "Suica" cards are used in Japan (1), and recent 20 usage history (date, used station name, remains, usage) are recorded in a card (2)(3). As for a data input/output interface we can use uncontact interface (4). Therefore, we chose "Suica" card.

Nevertheless, most widely used mobile device is cellular phone, but current cellular phones are not able to use without any inhibition in requirements (3), (4).

Fig. 4. “Suica” card

3.2 System Configuration

Figure 5. illustrates the system configuration. The system is consists of client PC that collects the usage history data from "Suica" card and server PC that handles the data management and visualization. For the data input from "Suica" card, we adopted the same interaction style when we use usually use "Suica" card at the automatic ticket wicket at the station.

3.3 Interaction Design

It is important to demonstrate the capability of proposed system that can deal with mass participants in general public. Thus, we primarily designed the interface to make

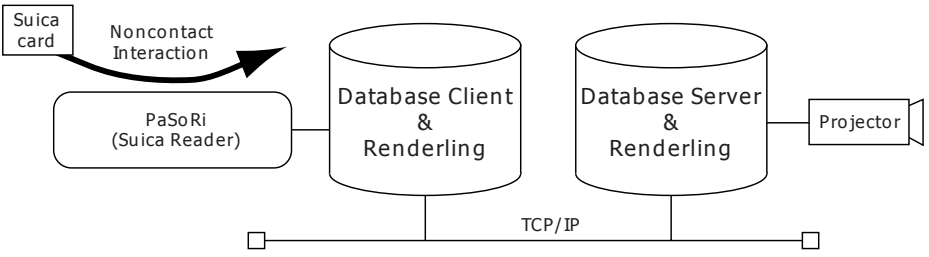

Fig. 5. System Configuration

visitors to voluntarily participate in interaction with developed system. For the implementation we took care of following two goals.

1. make participants enjoy by the interaction
2. afford participants how to make an interaction

Most of "Suica" card users do not know that their usage histories were recorded inside the memory. Therefore, visualizing these recorded data may enjoy the participants in a sense that they can remind their past experiences. As mentioned above, we design the package similar to actual automatic ticket wicket as possible (Figure 6).

Fig. 6. Interaction Style using “Suica” card

Developed application is named "Sharelog". In "Sharelog", if participants have their own "Suica" card can interact with the system and the system will display their used station records on the map from the oldest data. Traveling pass expected from used station records displayed in animation on the map is accumulated on the display so that each participant can compare and share their experiences in city of Tokyo (Figure 7). Each participant record is kept in anonymity.

Fig. 7. Visualized Traveling Pass data from Participants' "Suica" cards

4 Experiment Results

For the experiment we exhibited our "Sharelog" at the exhibition of media art at Tokyo Metropolitan Museum of Photography. At the exhibition, a docent is staffed for giving commentary to visitors. Then general visitors can also make an interaction with "Sharelog", if they carry a "Suica" card. We made an evaluation about "Sharelog" by observing participants behavior and asking for their impressions.

4.1 Museum Installation

The exhibition period was 10 days and we had 3,201 participants for "Sharelog". Total 60,355 recorded used station data was input to the system. Figure 8. shows the changes in total visitors, expected users and participants of "Sharelog". The number of expected users is the estimated visitors who carry "Suica" card. From statistics, 48.5% of people have "Suica" card in Tokyo. We calculated the number of expected users from this the number of visitor multiplied by this ratio.

4.2 User Studies

As an evaluation, we observed following reactions from the participants. Many participants had an experience of reminding their past experiences after a time, but they could not remind at the moment they saw displayed their train boarding records. Also, we observed many times that from reminded experience memory encourages communication to speak her/his personal memories among accompanying person or a docent. Accumulating all the traveling pass of participants and coloring ongoing participant's traveling pass in different color seemed to have an effect of encouraging communication. In many cases, communication starts by referring her/his memory about the place they went and then she/he refers to places where other participants went. In addition, the system projects circles on the map as representatives of stations and projected circles grow larger according to the number of used station records from participants. This presentation had an effect to notice that the particular stations

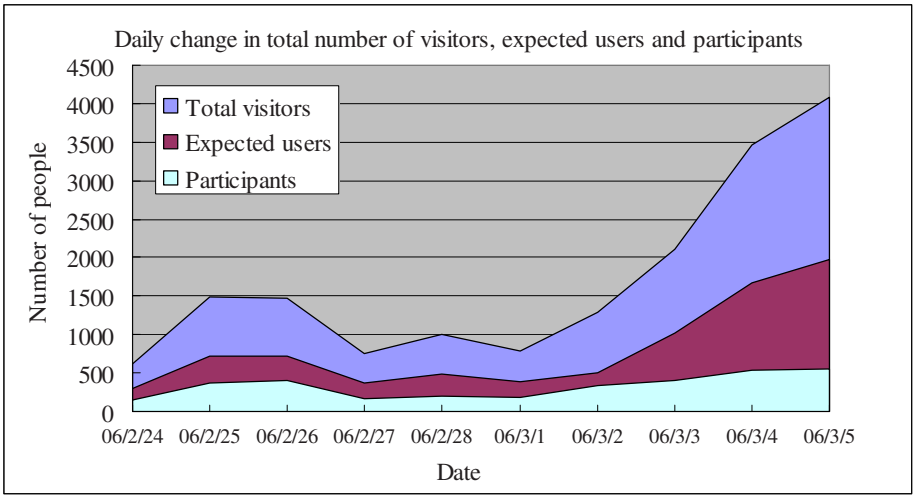

Fig. 8. Daily change in total number of Visitors, Expected Users and Participants

Fig. 9. Highlighted Stations (circle parts) in the Map of Tokyo

were used heavily in Tokyo (Figure 9). Many participants mentioned to this point. Some participants felt uncomfortable feeling in visualizing their personal traveling data. Especially, participants who did not explained the system characteristics well before they make interaction to "Sharelog" had this tendency.

5 Conclusion

Utilizing widespread consumer mobile devices as system platform enabled to develop an application that can be experienced by general public with ease. There are many

advantages for system developers by using these kinds of mobile devices as an interface for ubiquitous computing application, since developers are enabled to focus on their work on application content side. For our future work, we would like to examine a way to adopt cellular phones equipped with GPS and camera as a public user interface for our new application.

References

1. http://www.apple.com/ipod/ipod.html
2. http://www.nintendo.co.jp/ds/
3. http://www.flickr.com/
4. http://www.youtube.com/
5. Sony Computer Science Laboratory. http://www.placeengine.com/
6. http://www.espgame.org/
7. von Ahn, L., Dabbish, L.: Labeling images with a computer game. In: Proceedings of the SIGCHI conference on Human factors in computing systems, pp. 319–326 (2004)
8. Sakamura, K., Koshizuka, N.: Ubiquitous computing technologies for ubiquitous learning. In: IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'05), pp. 11–20 (2005)
9. Kidd, C.D., Orr, R.J., Abowd, G.D., Atkeson, C.G., Essa, I.A., MacIntyre, B., Mynatt, E., Starner, T.E., Newstetter, W.: The aware home: A living laboratory for ubiquitous computing research. In: Streitz, N.A., Hartkopf, V. (eds.) CoBuild 1999. LNCS, vol. 1670, Springer, Heidelberg (1999)