
Space Copy & Paste: Grabbing Space-Based User Experience to Support Reminiscence

Ohbyung Kwon

Kyung Hee University
Seoul 130-701 South Korea
obkwon@khu.ac.kr

Jae Mun Sim

Kyung Hee University
Seoul 130-701 South Korea
deskmoon@khu.co.kr

Nam Yeon Lee

Research Center for Ubiquitous
Business and Services
Kyung Hee University
Seoul 130-701 South Korea
ciel@khu.ac.kr

Keunho Choi

Wayne State University
4815 Fourth St.
Detroit, MI 48202 USA
kchoi@wayne.edu

Kyoung-Yun Kim

Wayne State University
4815 Fourth St.
Detroit, MI 48202 USA
kykim@eng.wayne.edu

Min Yong Kim

Kyung Hee University
Seoul 130-701 South Korea
andy@khu.ac.kr

Abstract

One of the visions of well-being life care is to provide the users with an experience to support reminiscence, whenever, wherever they want in an unobtrusive manner. However, legacy pervasive systems seldom consider this full experience. In this paper we propose a novel pervasive reminiscence method that grabs, saves, and retrieves an individual experience in a pervasive manner. Since the method is inspired by copy & paste functions in presentation software tools, our prototype is called Space Copy & Paste—consisting of two methods (i.e., space copy and space paste). To show the feasibility of the pervasive shopping with space copy & paste service, we performed an experiment to validate the proposed method.

Keywords

Pervasive computing, life experience, smart space, reminiscence

ACM Classification Keywords

H5.2. Information interfaces and presentation (e.g., HCI): User Interfaces

General Terms

Design, Experimentation, Human Factors

Introduction

As Cosely et al. [6] have mentioned, computer system capability can support human's reminiscence. This become more realistic as the viability of pervasive computing technology grows: it is increasingly possible to provide people with more convenient and natural information services. As a reminiscence supporting tool, pervasive information service is more than mobile service. It fully makes use of a variety of location and context, and allows people to experience, which is a source of reminiscence. Reminiscence is very practical in improving human 'well-being,' such as reminiscence therapy. Researchers have consistently reported that reminiscence significantly reduce depression, hopelessness and hence psychological well-being [2, 10]. Making use of the experience means that a system captures a moment of life of the people and then retrieves it to a variety of purposes, including recalling the past. Conventional mobile systems, however, have relied heavily on limited displays for mobile devices, and do not fully consider the overall experiences.

Hence, the purpose of this paper is to propose a novel pervasive reminiscence supporting tool that grabs, saves and retrieves individual experiences anytime and anywhere. Since this feature is similar to the copy & paste feature common to most software, our service is called Space Copy & Paste. Space copy requests an experience from any smart space with a sensory network, and forwards the data to a remote personal repository, which is formatted as an ontology language. Space paste refers to an experience stored in the user's personal repository, available whenever the user wants, and sends it to devices in the user's space.

Related Work

Reminiscence is very useful in our everyday life in variety ways. For example, people may resume shopping and procurement from reminiscing the past shopping experience. To do so, in the store, a variety of mobile and embedded systems are installed with the purpose of enhancing the user's shopping experience [9]. Project Voyager examines the use of context-aware computing as a shopping assistant [7]. The Personal Shopping Assistance is another experimental system that provides personalized shopping assistance [3].

Reminiscence therapy can be supported by reminiscence support tool, such as Pensieve [6]. Pensieve is an outstanding system that allows people reminisce through emails containing either social media or text about common everyday life situations, which is characterized by a set of context. Through Pensieve, people get more motivated to write more about their memories. Hence, it would be more efficient and unobtrusive if reminiscence support tools minimize manual input, even though reminiscence does not need exact and abundant set of contextual information; because context data should be obtained in a dynamic manner and hence manual input would be very costly to the users. However, efforts with legacy pervasive tools still suffer from providing services that can manipulate the experience very well, or resuming a sort of activity at any time or anywhere the user needs. While some systems do manage physical information in way to increase the sense of reality for individual activity, they seldom regard information services as an agent. Thus, an advanced concept of pervasive reminiscence support tool that addresses the actual life experience in a more sophisticated manner is needed.

Space Copy & Paste System

Overall Framework

Space copy & paste system for reminiscence support is composed of space copy subsystem and space paste subsystem. The space copy subsystem allows the user to search, select and copy the desired context at the located place. The space paste subsystem retrieves experience ontology and instance file indexed by experience ID to realize reminiscence-based services. Space copier, a proposed system, is a highly personalized contextual data gathering & saving tool that corroborates between devices to gather and manage space-based experiences. The system framework is shown as Fig. 1.

Space Copy & paste

The space copy & paste consists of the functions as follows:

- ① Finding service providers
The user's current location is recognized by delivering access pointer or GPS sensing data. At this point, a service provider searches a list of services that the user can use.
- ② Selecting available application services
If you select Paste after choosing what you want on the list of services, the space master requests each service for a context log and for saving the result of the copy in the personal repository.
- ③ Searching for the players
A player that can "play" the copied reminiscence-based service with context log is searched in a

certain space, subject to the information of smart device as service player.

- ④ Service selection and paste

A desired service among the searched devices is operated by pasting. The service player reproduces the delivered context log.

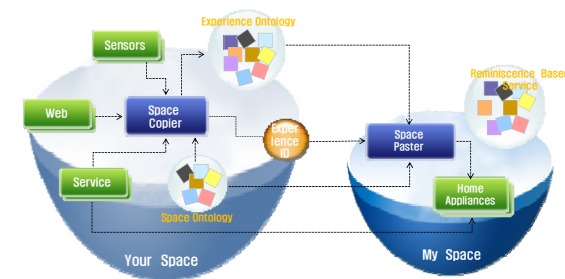


figure 1. Overall framework

Experience

User experience holistically describes the relationship that a user has, when using an application and the resulting product of this interaction. At the same time, context, which surrounds the user, such as temperature, sounds and images, is considered. Based on the user experience, people may perceive pleasure or frustration, which is a queue of reminiscence [4]. Hence, users want more than simply memorize what they are doing: they rather perceive the space-based experiences, and then retain the experience for later reminiscence. To support reenacting the experience, and hopefully also to increase the user's perceived sense of well-being, a user's experiences must be identified, stored, and retrieved in a relevant manner. Relevance here means

that the experience data does not need to be complete, because more often human is not able to reminisce and behave something with a few triggers that stimulate a sort of reminiscence [5]. Hence, collecting full set of experience in a costly manner may not be necessary.

Ubiquitous Care with Space Copy & Paste System

Implementation

To show the feasibility of the idea of space copy & paste, we developed a ubiquitous caring system for solitary person (called Smart Medicine Refrigerator, SMR) as shown in Fig 2(a). Based on the functionality of the MR (Medicine Refrigerator), the SMR plays a role as space paster. Using wireless communication, the SMR accesses to the user's personal resource, which involves experience ontology instance. The SMR finds a specific experience with two manners: pull and push. Using the pull menu, the user scrolls the past experiences named as meaningful themes and eventually the source of reminiscence, such as my birthday party and shopping with my friend (Fig 2(b)). By clicking on a link of a specific experience, the corresponding context data are downloaded from the experience ontology. Then the SMR forwards the context data to the home appliances in vicinity, so that the appliances are set according to the context data. On the other hand, the push menu is used to trigger personal reasoner to estimate the user's psychological state based on user profile, past caring history and current context. Now the SMR estimates the level of depression, stress and fatigue. For the estimation, the SMR contains sensor nodes about temperature, noise, humidity and illumination, as shown in Fig.2(c). From the statistical reasoning by multiple regression analysis, sensor data are revealed to be helpful to estimate the

user's psychological symptoms (e.g., stress, depression, fatigue, rage) [12]. The psychological symptoms as a fraction of user experience can be a catalyst of reminiscence. Besides, user profile and some simple questionnaires to ask current emotion and psychological symptoms are acquired at the beginning time of using the SMR for better estimation. The context data from physical sensors, user profile and questionnaires are used to estimate the content and strength of reminiscence by associative model and case-based reasoning. The reasoning method and performance of estimation have been shown in [11].

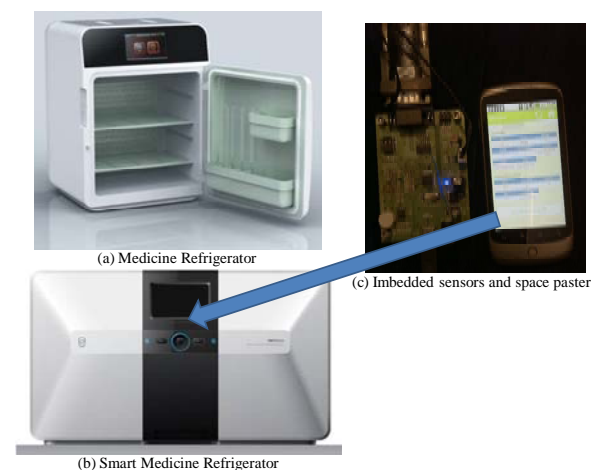


figure 2. Smart medicine refrigerator for reminiscence therapy

User Acceptance Test

We used a survey to evaluate to what extent the space copy & paste system would be accepted by potential users. The data was collected over a three month period. The participants were employees and grad

students. The participants were provided with videos that described two scenarios of space copy & paste service. Then the participants were allowed to make any questions to make sure what the service really means. As a result, we acquired data from 235 samples. Among those, 10 samples were excluded due to insufficient answers, netting 225 samples accepted for data analysis.

To evaluate the potential user's intention to use of space copy & paste system, some psychological factors, which have been widely regarded as explaining intention to use, are considered. Perceived usefulness indicates that the user's subjective belief that space copy & paste system can contribute to increase the effectiveness or efficiency of well-being care, such as reminiscence therapy. Perceived ease of use means that the user can successfully manipulate service copy & paste system with fewer perceptual efforts [8]. Perceived social influence refers to the belief that gaining approval from others about using space copy & paste system is important [1, 13]. Hence, a person who has higher level of perceived social influence is more likely to use the system to be classified as an important person in her or his society. Perceived playfulness is a degree of belief that space copy & paste system will meet her or his intrapersonal satisfaction, such as fun, pleasure, and enjoyment [10]. Besides, we additionally included perceived intelligence, which is a representative feature of pervasive computing. Person of higher perceived intelligence will expect that space copy & paste system can provide reminiscence-based services successfully with the copied context data [14]. The factors are evaluated as 7-Likert scale from 'fully unacceptable' to 'fully acceptable'.

The evaluation results are shown as Table 1. The mean values of all factors were greater than 4.0. In particular, the value of perceived usefulness, perceived playfulness and intention to use were relatively higher than any other factors with less standard deviation. We could conclude that the participants were very positive in accepting the space copy & paste service.

table 1. Descriptive statistics related to space copy & paste system acceptance

Factor	N	Range	Mean	Standard Deviation
Perceived Usefulness	225	6.00	5.12	.07782
Perceived Ease of Use		5.00	4.96	.07938
Perceived Social Influence		6.00	4.34	.08642
Perceived Playfulness		6.00	5.46	.07688
Perceived Intelligence		5.75	4.32	.08186
Intention to Use		5.40	5.22	.07868

Conclusion

Our vision of reminiscence support tools by space-based experience manipulation is explained in this paper. Space context is more than just records of sound or image: space is an indexed set of user experience and a trigger of reminding the experience, which is useful for personal subjective well-being care. Although the sound and image may stimulate the user's memory in a cognitive and affective manner, they are not well structured in performing or facilitating any well-being care.

Full implementation of space copy & paste service for psychological care is now undergoing in our project. The smart phone is now considered as a platform of space copier, while the SMR plays as space paster. Moreover, we are expanding the features of space copy & paste to manipulate space-based user experience. In special, since people are an important focus of reminiscing, we should consider how to represent people using additional context data such as images and sound.

Acknowledgements

This research is supported by the ubiquitous Computing and Network (UCN) Project, the Ministry of Knowledge and Economy (MKE) Knowledge and Economy Frontier R&D Program in Korea as a result of UCN's subproject 11C3-T2-10M.

References

- [1] Ajzen, I.: The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211 (1991)
- [2] Arian, P. A., Perri, M. G., Nezu, A. M., Schein, R. L., Christopher, F., & Joseph, T. X.: Comparative effectiveness of social problem-solving therapy and reminiscence therapy as treatments for depression in older adults. *Journal of Consulting Clinical Psychology*, 61(6), 1003-1010 (1993)
- [3] Asthana, A., Cravatts, M., Krzyzanoski, P.: An indoor wireless system for personalized shopping assistance. *IEEE Workshop on Mobile Computing Systems and Applications*, IEEE Computer Society Press, Santa Cruz, California (1994)
- [4] Berlyne, D.: *Aesthetics and Psychobiology*, Appleton-Century-Crofts, New York, 1971
- [5] Chan, W.: *Project Voyager: Building an Internet Presence for People, Places, and Things*, in *Media Laboratory*. Massachusetts Institute of Technology: Cambridge, MA, 57 (2001)
- [6] Cosley, D., Akey, K., Alson, B., Baxter, J., Broomfield, M., Lee, S., Sarabu, C.: Using technologies to support reminiscence. *Proceedings of BCS CHI'09*, 480-484 (2009)
- [7] Cosley, D., Schwanda, V., S. Peesapati, T., Schultz, J., Baxter, J.: Pensieve: Supporting everyday reminiscence. *Proceedings of the CHI '10, 2027-2036* (2010)
- [8] Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340 (1989)
- [9] Kalyanam, K., Lal, R., Wolfram, G.: *Future Store Technologies and Their Impact on Grocery Retailing. Retailing in the 21st Century Current and Future Trends*, Springer Berlin Heidelberg, 95-112 (2006)
- [10] Kourouthanassis, P., Roussos, G.: Developing consumer-friendly pervasive retail systems. *Pervasive Computing*, 2(2), 32-39 (2003)
- [11] Kwon, O.: *Annual Report: Development of Semantic Lifecare Index and Meta Service Framework for u-Smart Space*, Kyung Hee University, UCN, 2010
- [12] Kwon, O.: *Methods of Estimating Stress, Depression, Rage and Fatigue*, Technical Report (09C1-T2-10M-R-T2A-1_v0.5), Kyung Hee University, UCN, 2011
- [13] Van der Heijden, H.: User acceptance of hedonic information systems. *MIS Quarterly*, 28(4), 695-704 (2004)
- [14] Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D.: User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478 (2003)