A Design of User-Based Voluntary Service Recommendation Program Using Mobile Push Services for Health Care

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# A Design of User-Based Voluntary Service Recommendation Program Using Mobile Push Services for Health Care

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**Abstract**

Designing the User-Based Voluntary Service Recommendation Program proposed in this study was motivated by the fact that it is not easy for volunteers to find a place for their services. Even though there are many volunteer centers or organizations, volunteers often experience difficulty in where and how they should apply for their work as those places are not well promoted. Thus, this program has been designed by applying the mobile push services along with location technology. The authors plan to introduce the program to the public as an open source by implementing the program with both Android and Python - hoping that the program will be useful to the users and volunteer organizations.

## 1. Introduction

Volunteer works are the voluntary services carried out for society or others selflessly without expecting any compensations. Volunteers can be individuals or any organizations. Currently in the Republic of Korea (ROK), some of the volunteer services are being provided by the people who seek employment or apply for college. In some cases, foreigners participate in volunteer services to acquire permanent residency. Finding a place for volunteer work is unexpectedly difficult as most of volunteer centers or organizations in the ROK do not actively promote themselves yet. Therefore, this program included several additional functions with which one can find information about volunteer centers/ organizations or their service contents in addition to application process. Users can also find out the benefits that they offer. The main object of this program is to increase the number of volunteers and promote the significance of volunteer services.

## 2. Related Research: Mobile Push Services

Mobile Push services send information to users automatically without the request of users. Such push services are mainly activated by an event such as a specific area is entered or a timer is reached [1]. Researchers have paid more and more attention to the push services models and strategies. Some of them try to combine the pull service and the push service, which is named push-pull service. Tosi [1-2] proposed an advanced architecture for push service by combining location with the presence services to push the infotainment and info commercial via 3G wireless systems. Bhide et al. [1,3] combined pull and push service to achieve the best features of both approaches to disseminate the time varying web data. Bessis et al. [1,4] described in detail the model architecture in the form of a UML activity diagram, as well as its mathematical modeling analysis for keeping interested stakeholders informed automatically about relevant and critical data changes. ELVIN [5-6] is the only notification system that implements limited support for mobile users. The proposed solution puts a proxy server between the ELVIN server and a mobile device to queue messages for non-active users. The presented solution implements a queuing strategy with time-to-live expiry, but it is not clear how location management and distribution are handled.

Y. Huang et al. [5,7] discusses the operation of mobile P/S systems and analyzes the adaptation of a centralized and a distributed architecture to mobility. The presented ideas and identified problems have motivated our work. However, we analyze the system from the user's perspective as opposed to their system centric view and present an initial system architecture. CEA [5,8] and JEDI [5,9] are P/S middleware
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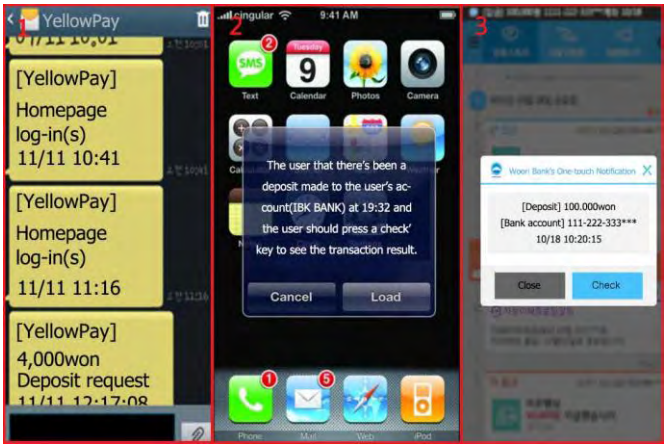
systems that offer mobility support. CEA uses a mediator which receives notifications on behalf of a subscriber during disconnections. The mediator can register interest in a subscriber's location, get a notification when it reconnects, and then deliver the queued messages to the new location.

JEDI [5, 9] offers two operations: moveIn, and moveOut. A subscriber uses moveOut to disconnect from a CD and move in to reconnect to a new CD. The old CD stores events on behalf of the subscriber during the disconnection and transmits them to the new CD upon reconnection. Both CEA and JEDI solve the queuing problem, but the routing problem remains open. G. Cugola et al. [5,10] proposes a solution with a dynamic dispatching tree that has a leader responsible for subscribers with the same subscription. This solution requires a complex protocol and further study is needed to evaluate it. In the area of telecommunications the problems related to mobility are well-understood. However, wireless networks offer limited possibilities for the design, implementation, and deployment of services [12-13].

The third generation partnership project (3GPP) [5,11,12] is trying to solve this problem by offering an API specification to enable third parties to design and deploy services using the network provider infrastructure. 3GPP has recently specified the functional capabilities of the Multimedia Messaging Service (MMS), the successor of the Short Message Service (SMS). MMS will provide non-realtime multimedia messaging in 3G networks. The MMS specification focuses on one-to-one usage scenarios, but considers one-to-many communication scenarios that will offer functionality similar to mobile push [5, 12, 13].

The push system is a information or data delivery system where the process begins at the central server when a request is made. It automatically provides news or other information whether the user requests them or not. Following (Fig. 1) is an example of the message service that uses the push system. (Fig. 1) is divided three sections and the first yellow colored column (Yellow Pay Service) shows the 'log-ins' and a 'deposit request' of 4,000 won. The message in the middle of the second column informs the user that there's been a deposit made to the user's account (IBK bank) at 19:32 and the user should press a 'check' key to see the transaction result. The third message on the right is the 'One-touch Notification Push Service' by Woori Bank [13].

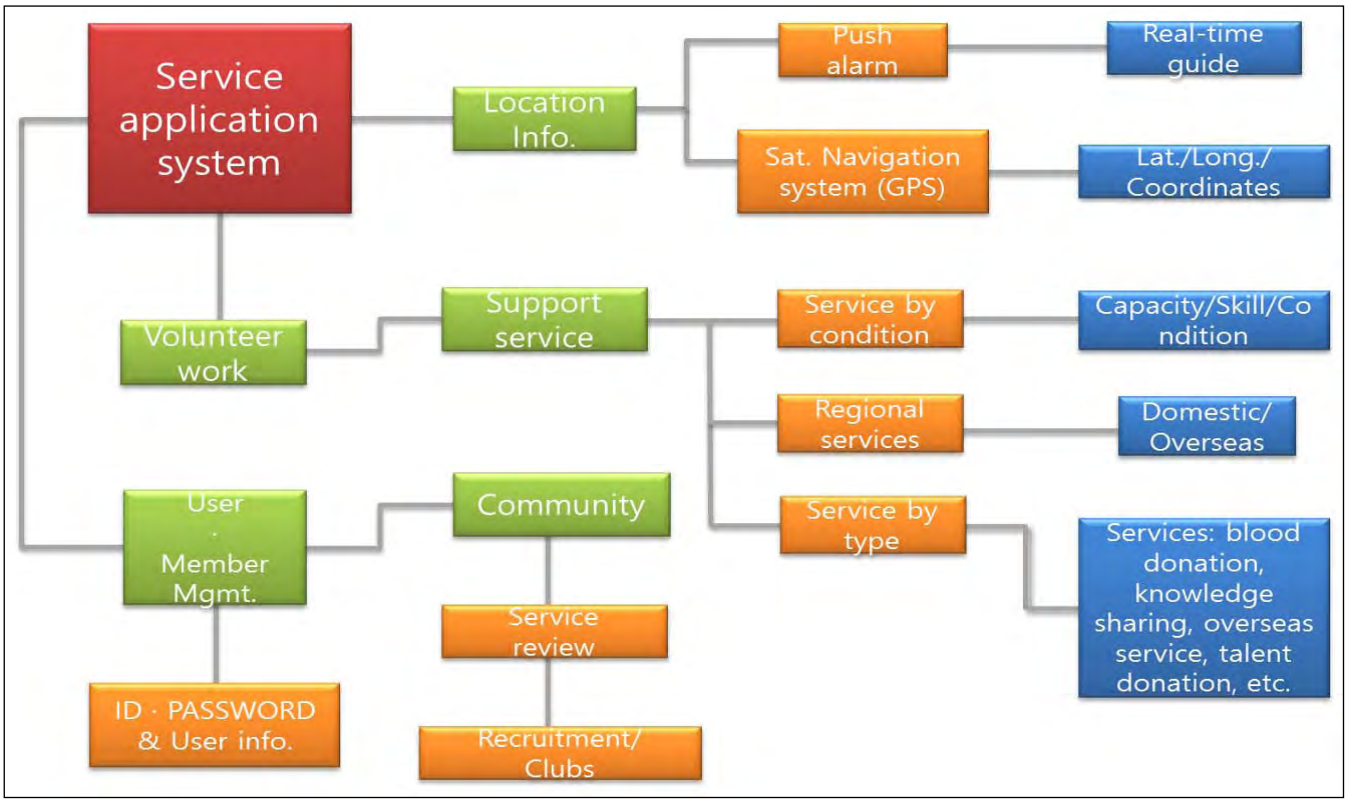


(Fig. 1) An Example of Message Service Using the Push System.

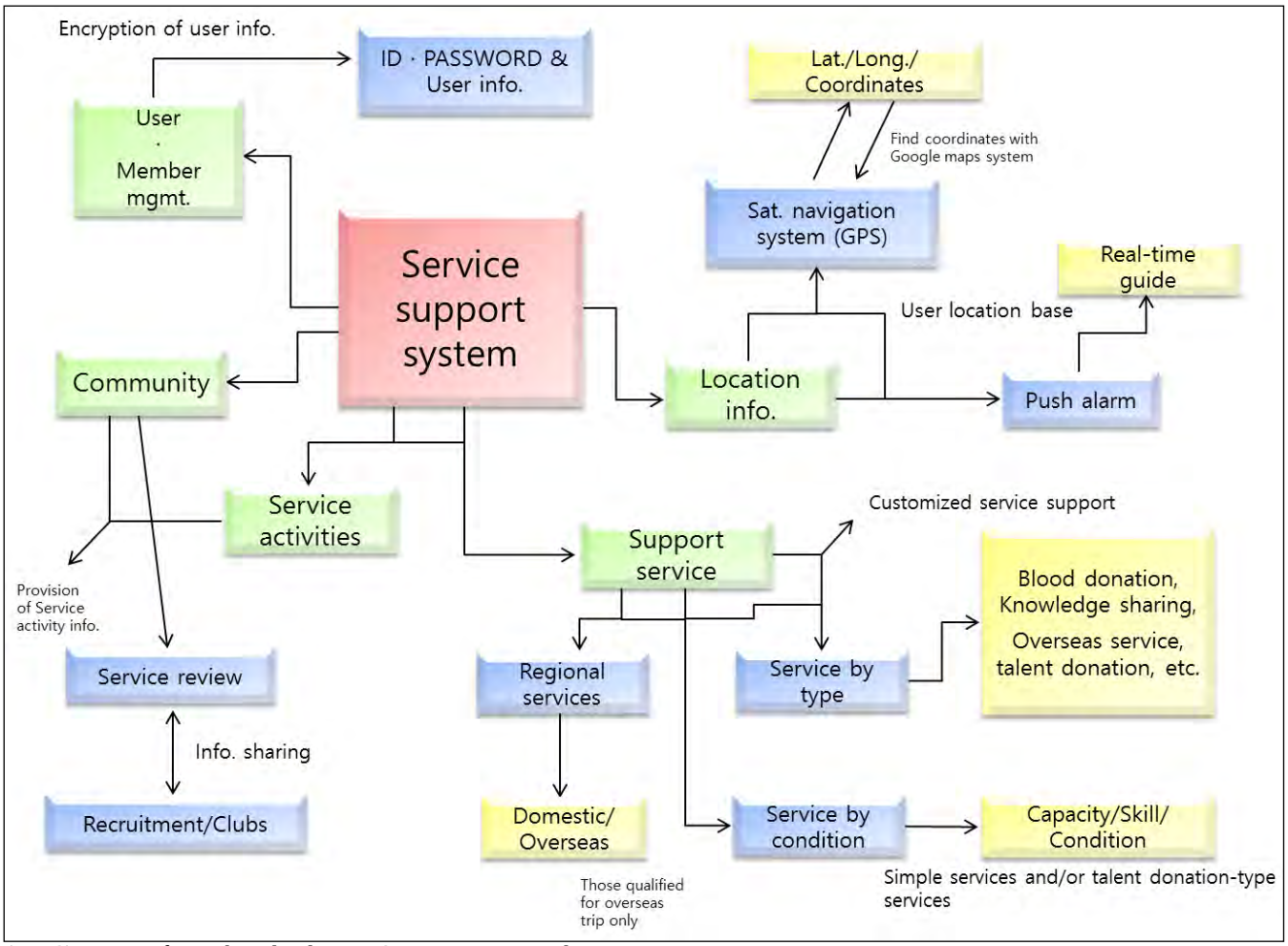
Information deliveries with the Mobile push system are carried out numerous times when one uses Smart Phone. For instance, when people write comments on someone's Facebook account, they will be transmitted to the smart phone of account holder in real time. That happens because the Facebook application in the user's smart phone normally remains as the "Background State" and notifies the user once an event is triggered or the service state has been changed for some reason. Currently, the APNs (Apple Push Notification Service), GCM (Google Cloud Messaging) and MPNs (Microsoft Push Notification Service) have been introduced for each smart phone operating system available [13].

3. Design of User-based Voluntary Service Recommendation Program

The volunteer service recommendation program designed based on the user's location/position is a service application which supports various functions including a function that provides information regarding volunteer service centers/organizations such as blood donation centers. The program has been designed based on the Android operating system. Current coordinates of a user can be obtained with the GPS-embedded or networked smart phones but the proposed program takes a further step by acquiring the coordinates of volunteer centers/organizations in advance and storing them in the database. By using the database and a linear equation, users will be able to find the nearest volunteer center and its information such as building name, address and contact details. The characteristics of volunteer service include the following: self-motivation that selflessly serve neighbors or society who need assistance with one's own motive, time, skill and experience; selflessness that does not seek any benefits, especially financial considerations; public benefit that improves the quality life by solving the problems dispersed throughout the society; and sustainability (consistency) that requires continuous and regular service provisions for a certain period. Also, volunteers should exactly understand the purpose of their volunteer works and participate in them with a pure mind, positiveness and try to set a good example. Additionally, they are required to take care of others sincerely, faithfully fulfill their task in responsible and careful manner. They should also have the ability and quality of being able to distinguish between their own business and volunteer works regardless of their respective personal problems or emotions. This program is an O2O service program that lets potential volunteers to find an appropriate place for their service based on their positions. The program aims to conveniently provide volunteers with the information related to various volunteer opportunities and information to create better conditions for them to be able to actively participate in the volunteer services. With this program, volunteers will be able to receive dependable information conveniently without delay. (Fig. 2) shows user experience design and UX design. Also, (Fig. 3) shows design of user-based voluntary service recommendation program.



(Fig. 2) User Experience Design and UX Design.



(Fig. 3) Design of User-based Voluntary Service Recommendation.

4. Conclusion and Future Works

In this study a volunteer service recommendation grogram has been designed by applying a mobile push function together with positioning technology. The designed program, which will be introduced to the public as an open source, has been implemented with Android and Python.

The future tasks involve other programs which would increase volunteer opportunities. As the program was intended for the Android operating system, it will be necessary to modify it for the IOS operating system as well. The expected effect of this program is that it would expand volunteer pool and opportunity by offering dependable information and more benefits to the participating volunteers. The program will set better conditions for the potential volunteers while volunteer centers/organizations will be able to recruit more better-prepared volunteers.

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The 4D Health Care refers to an advance health care technology which is used for the operation in a 4D-based mixed reality where human senses, cognition and experiences (1D) have been converged with both real and virtual information (3D) and the project group runs various curricular and extracurricular programs to train every participating student to acquire a 4D technology-based health care contents development skills.

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References

[1] Tongyu Zhu, Yuan Zhang, Fei Wang, Weifeng Lv, “A Location-Based Push Service Architecture with Clustering Method,” Networked Computing and Advanced Information Management (NCM), 2010 Sixth International Conference on IEEE, pp. 107-112, 2010.

[2] D. Tosi, “An Advanced Architecture for Push Services,” Proceedings of 4th International Conference. Web Information Systems Engineering Workshops (WISE '03), pp. 193 - 200, 2003.

[3] M. Bhide, P. Deolasee, A. Katkar, “Adaptive Push-Pull: Disseminating Dynamic Web Data,” IEEE Trans. Computers, vol. 51, pp. 652-668, 2002.

[4] N. Bessis, E. Asimakopoulou, M. Conrad, “A Mathematical Analysis of a Data-Grid Push Service for Disaster Management Response Scenarios,” Proceedings of International Conference of Computing, Engineering and Information, pp. 8-11, 2009.

[5] Ivana Podnar, Manfred Hauswirth, Mehdi Jazayeri, “Mobile Push: Delivering Content to Mobile Users,” Proceedings of the 22nd International Conference on Distributed Computing Systems Workshops (ICDCSW’02), pp. 563-568, 2002.

[6] P. Sutton, R. Arkins, B. Segall, “Supporting Disconnectedness-Transparent Information Delivery for Mobile and Invisible Computing,” Proc. IEEE Int. Symposium on Cluster Computing and the Grid , IEEE CS Press, Los Alamitos, pp. 277–285, (Brisbane, Australia), 2001.

[7] Y. Huang, H. Garcia-Molina, “Publish/Subscribe in a Mobile Environment,” Proc. 2nd ACM Int. Workshop on Data Eng. for Wireless and Mobile Access (MobiDE’01), pp. 27-34, (Santa Barbara, Calif.), 2001.

[8] Jean Bacon, et al., “Generic Support for Distributed Applications,” IEEE Computer, 33(3):68–76, March 2000.

[9] G. Cugola, E. Di Nitto, A. Fuggetta. The JEDI Event-Based Infrastructure and Its Application to the Development of the OPSS WFMS. IEEE Trans. on Software Eng., 27(9):827–850, September 2001.

[10] G. Cugola, E. Di Nitto, “Using a publish/subscribe middleware to support mobile computing,” Advanced Topic Workshop on Middleware for Mobile Computing, (Heidelberg, Germany), 2001.

[11] 3GPP website, “The Third Generation Partnership Project,” 2001. http://www.3gpp.org/.

[12] Jun-Ho Huh, Namjug Kim, Kyungryong Seo, “Design and Implementation of Mobile Medication-Hour Notification System with Push Service Function, International Journal of Applied Engineering Research, Research India Publications, Vol.11, No.2, pp. 1225-1231, 2016.

[13] Joonheung Park, Taehoon Koh, Jun-Ho Huh et al., “Design of the Real-time Mobile Push System for Implementation of the Shipboard Smart Working,” Advances in Computer Science and Ubiquitous Computing, Springer LNEE (CUTE 2015), Vol. 373, pp. 541-548, 2015.