

## A Study on Smart Trash Can and User UX Designs: A Software Engineering Approach for Health Care

윤준호\*, 배근표\*\*, 허준호\*\*\*

\*부산가톨릭대학교 응용과학대학 소프트웨어학과, \*제 1 저자, \*\*공동 1 저자

\*\*\*부산가톨릭대학교 응용과학대학 소프트웨어학과 조교수

\*\*\*교신저자 e-mail : 72networks@cup.ac.kr

## A Study on Smart Trash Can and User UX Designs: A Software Engineering Approach for Health Care

Jun-Ho Yoon\*, Geun-Pyo Bae\*, Jun-Ho Huh\*\*\*

\*Dept. of Software, Catholic University of Pusan

\*\*\*Assistant Professor of Dept. of Software, Catholic University of Pusan

\*\*\*Corresponding Author e-mail : 72networks@cup.ac.kr

### Abstract

In this study, a function that informs the trash can users about daily collectable trash types and the visiting schedule of collection trucks with an application-based push alarms is proposed along with other function that lets the user to receive the information regarding the volume of trash cans located near his/her residence and monthly average trash volume once the user registers his/her personal information online. These functions are used for the UX design between smart trash can and users. The proposed system allows trash collection trucks to find the most efficient path from their current positions by finding out users' trash can volumes in advance. The UX design and the smart trash can system proposed in this study aim to improve the trash processing efficiency by allowing users to check the volume of their trash.

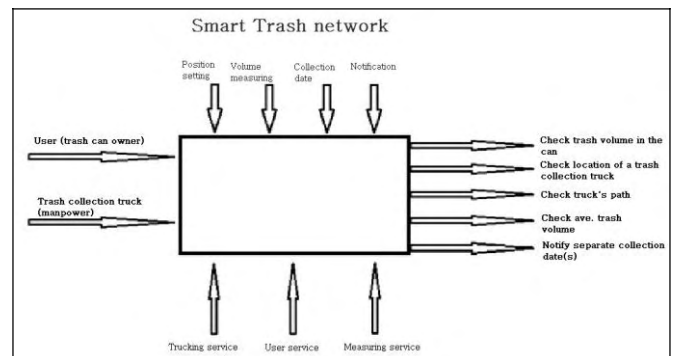
### 1. Introduction

Republic of Korea (ROK) is one of a handful countries where people still dispose trash in a standard garbage bag following the volume-rate garbage disposal system. This system is being enforced since 1994 in the ROK. As a result, the volume of garbage has been largely reduced but the number of incidents where people surreptitiously throwing away their garbage has also increased. This has been a social issue for a long time so that the ICT-based applications that can be used to catch such an act are being continuously introduced or upgraded. However, as this alone would not solve the problem, other means had to be devised. Smart Trash Cans have been drawing attention for some time but it is still hard to find them on the street. Thus, this study focused on a user UX design for the smart trash can to improve its practicality.

### 2. Smart Trash Can and User UX Designs

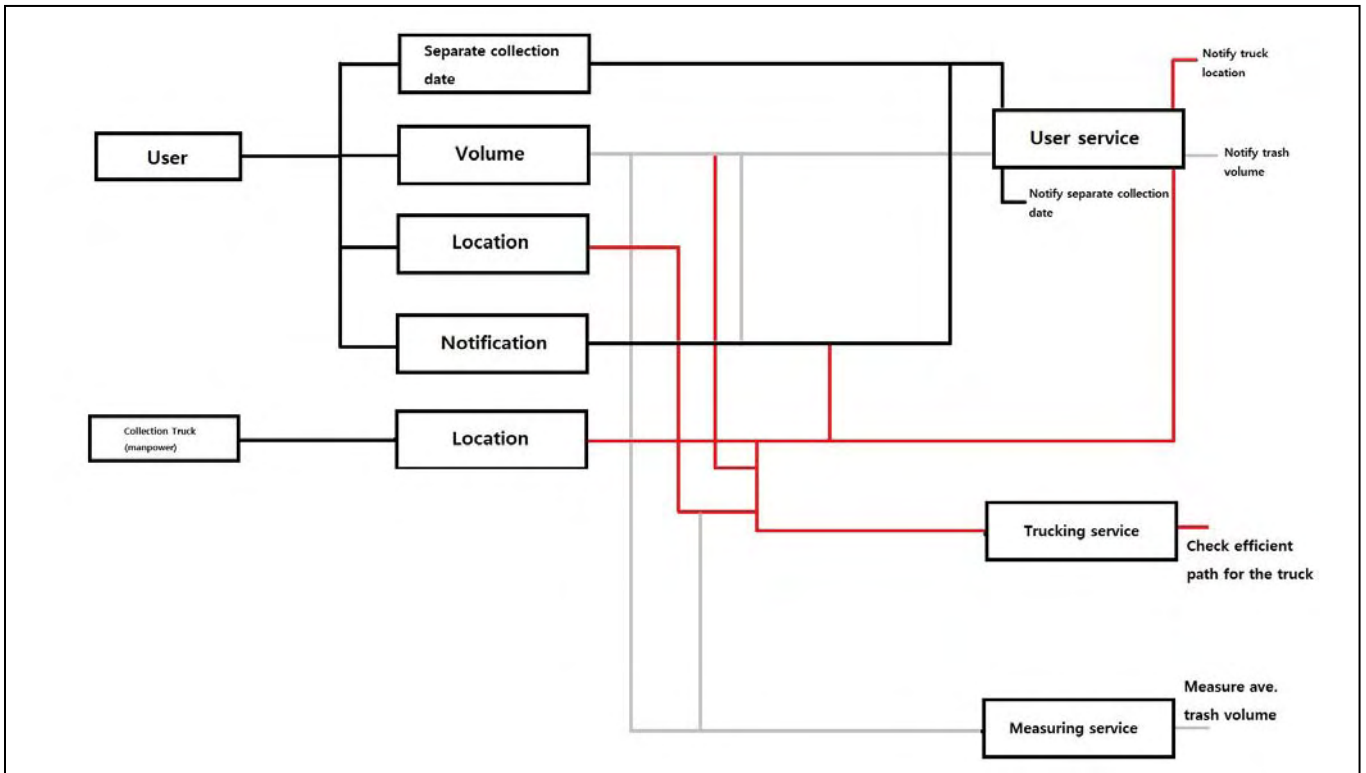
UX design between Smart Trash Can and user the core of the proposed trash can is that some smart features have been grafted onto the trash can itself to establish a network between the user, can and collection truck. That is, the useful information concerning the method of separate collection, location of collection truck, collection hours and volume of trash can are provided through an interface while the most efficient path is estimated for the trash collection truck by considering the locations of trash cans and their respective volume. User can also receive the information regarding

daily collectable trash, visiting hours of collection trucks, locations of trash cans and the volume of trash cans with a push-alarm function. The design based on a software engineering approach is presented below.



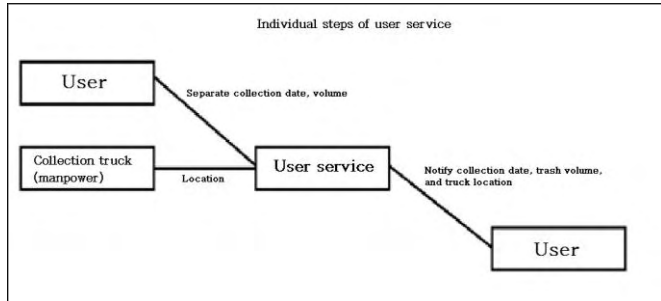
(Fig. 1) A Smart Trash Collection Network.

As shown in (Fig. 1), once the user or the collection truck sets the location, volume or date first, they can check the volume of a certain trash can, locations of collection trucks and their paths by using the relevant functions described on the right side.



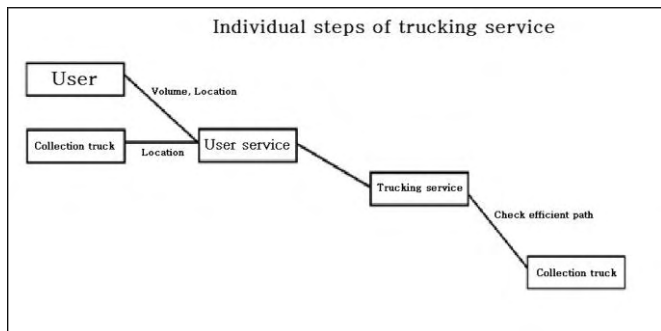
(Fig. 2) BPM of Smart Trash Can and User UX Designs.

(Fig. 2) is a BPM-style description of settings users or collection trucks need to set up to use the services.



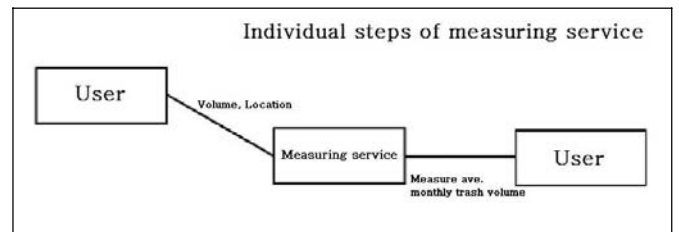
(Fig. 3) Individual Steps User Service.

(Fig. 3) describes the service where the user can receive the information concerning collection dates, the volume of trash in the trash can and the current location of trash collection truck (GPS-based service) once he/she sets his/her desired collection date and volume.



(Fig. 4) Individual Steps of Trucking Service.

(Fig. 4) describes the process where user sends the information regarding the volume of trash and location to the user service and then the trash collection truck replies by sending its whereabouts to the same service. The user service sends out these information to the trucking service in order for them to find the most efficient path for trash collection.



(Fig. 5) Describes Individual Steps of the Measuring Service

(Fig. 5) describes individual steps of the measuring service. Here, the information about the location of user and his/her monthly trash volume are recorded and notified to the user with graphs. Monthly average trash volume of a village or a town can be estimated as well with this measuring service.

### 3. Conclusion and Future Work

An UX between the Smart Trash Can and user has been designed in this study. Based on the design, we plan to implement the system with Java Android, install sensors on the trash cans and show current state with smart phones. We expect this system will reduce trash collecting manpower and contribute to environmental protection. The actual system will be revealed to the public as an open source to help urban communities once it is completed.

## Acknowledgments

The 4D Health Care Project Group of Catholic University of Pusan aims to cultivate the creative talent who have capabilities in developing 4D contents required for rehabilitation and health care of modern people. Both Department of Physical Therapy and Department of Software of this university are participating and operating the group jointly to perform the task.

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.

This has been written with the support of the 4D Health Care Project Group and the author wishes to express his gratitude to the Ministry of Education, National Research Foundation of Korea, as well as the CK Project Group. And this paper is the product of a team project performed in "Advanced Java Programing" Course at Dept. of Software, Catholic University of Pusan for the undergraduates.

Also, my gratitude extends to Catholic University of Pusan and the Lord who has provided me with his wisdom and grace.

## References

- [1] Jun-Ho Huh, Namjug Kim, Kyungryong Seo, "Design and Implementation of Mobile Push Service-Based Mobile Medication-Hour Notification System," ASTL, SERSC, Vol.117, pp.92-96 (2015)
- [2] Gary F. Birkenmeier, Jae Keol Park, S. Tariq Rizvi, "Ring Hulls of Semiprime Homomorphic Images," Modules and Comodules, Springer, Birkhäuser Basel, pp.101-111 (2008)
- [3] Jun-Ho Huh, Taehoon Koh, Kyungryong Seo, "A Design of Reefer Container Monitoring System Using PLC-Based Technology," Proceedings of the 2015 International Conference on Electrical and Information Technologies for Rail Transportation, LNEE, Springer, Berlin Heidelberg, Vol.377, pp.795-802 (2016)
- [4] Andrey GarnaeV, Yezekael Hayel, Eitan Altman, "A Bayesian Jamming Game in an OFDM Wireless Network, 10th International Symposium on Modeling and Optimization in Mobile," Paderborn, Germany, IEEE, pp.44-48 (2012)
- [5] Patrick Maillé, Bruno Tuffin, Jean-Marc Vigne, "Competition between Wireless Service Providers Sharing a Radio Resource," Networking, Vol.7290, pp.355-365, LNCS, Springer, Berlin Heidelberg (2012)
- [6] George Kesidis, Ihab Hamadeh, Youngmi Jin, Soranun Jiwaturat., Milan Vojnović, "A model of the spread of randomly scanning Internet worms that saturate access links," ACM Transactions on Modeling and Computer Simulation, Vol.18, No.2, Article No. 6 (2008)
- [7] Jun-Ho Huh, Soo-Yong Kwak, Sang-Young Lee, Kyungryong Seo, "Design of Small-Size Smart Trash Separation Box Using ICT Technology," Asia-pacific Proceedings of Applied Science and Engineering for Better Human Life, Vol.4, pp. 141-144 (2016)