Design and Implementation of General Drug Purchasing Place Search Application for Users' Convenience

EUN-JU PARK, KI-HWAN CHOI, HANKYU LIM
Department of Multimedia Engineering
Andong National University
1375 Gyungdong-ro, Andong-City, Gyungbuk
REPUBLIC OF KOREA
Corresponding Author: hklim@anu.ac.kr

Abstract: - Thirteen kinds of over-the-counter pharmaceuticals with small side effects and fast treatment effects became available in retail stores or convenience stores as well as d rugstores. This is expected to increase consumers' options for drug purchases and partially resolve discomfort triggered because drugs were only available in drugstores. Nonetheless, applications that inform the locations of stores where consumers can purchase pharmaceuticals mostly show the locations of drugstores only. In addition, many people do not know that they can purchase drugs in retail or convenience stores. Accordingly, this paper designed and embodied an application where users can search for the locations to purchase general pharmaceuticals including retail stores and convenience stores as well as drugstores. The researcher expects that the user of an application embodied in this paper will decrease discomfort occurring when purchasing drugs. Consumption of pharmaceuticals is directly related to human life and therefore requires safety.

1 Introduction

Accordingly, thus far, only drugstores that obtained license and permission have sold drugs [1]. However, consumers are seeking for alternative treatment methods through self-administration of general pharmaceuticals rather than pricey treatment and specialized pharmaceuticals, resulting from the increase in the means to obtain information on drugs, economic depression, and the aging of the population [2]. Domestically, pharmaceuticals are classified into two kinds: special pharmaceuticals and general pharmaceuticals [3]. General pharmaceuticals refer to drugs from which safety and efficacy may be expected even when they are used without prescription by doctors or dentists, with low concern for misuse or abuse [4][5]. On May 2, 2012, 13 k inds of over-the-counter pharmaceuticals were selected among general pharmaceuticals and sales of them were enabled in places like retail stores or convenience stores other than drugstores, which expanded ordinary citizens' right of selection of and accessibility to general pharmaceuticals [3][6]. Over-the-counter pharmaceuticals are digestive medicine, cold medicine, and so on that may be easily differentiated by consumers and whose safety has been obtained [2].

According to OZ's ranking site that informs useful domestic and overseas rankings and statistical data, the number of domestic convenience stores in the top five brands exceeded 30,000 as of March 2016 [7]. As purchase of over-the-counter pharmaceuticals is made possible in convenience stores and retail stores, the number of the places where consumers are able to purchase drugs reached more than 50,000 i ncluding drugstores (about 21,000 drugstores as of 2015) [8]. In other words, the number of places where consumers can purchase general pharmaceuticals was been increased. In addition, discomfort resulting from closure of drugstores during nighttime or holidays was resolved to some extent, which acts as a f actor to expand accessibility and the right of selection in sales of general pharmaceuticals.

Recently, as smart phone use increased, interest in applications necessary for ordinary life was heightened and smart phone applications with diverse uses have been developed [9][10]. Therefore, applications that provide information on places that sell medical

products have been also developed. Nonetheless, these applications do not provide information on places that sell medical products other than drugstores. In addition, many consumers do not know that convenience stores and retail stores sell drugs. Accordingly, this paper designed and embodied an application to search stores selling general pharmaceuticals. Although it is possible to purchase drugs in convenience stores, many people do not know that convenience stores sell drugs and therefore use distant drugstores. The purpose of the application embodied in this study is to give consumers help during emergency situations by swiftly providing information on dr ugs sold in drugstores and convenience stores. In addition, this study provided information on pharmaceuticals through diverse additional functions, information on various measures when an emergency situation occurred, an alarm function when to take medicine, and experts' counseling.

2 Related Studies

2.1 Requirement Analysis

A survey was conducted in order to examine the realization validity of "the application for searching stores selling general pharmaceuticals." The survey was conducted online from April 6 to April 20, 2016 and the total number of respondents was 106. Figures 1 t o 3 show the graphs of significant outcomes among the results of the survey. According to the graph in Figure 1, only 36 respondents, 34% of the total respondents, knew that they were able to purchase medicine in convenience stores. Seventy respondents accounting for 66% did not know that they were able to purchase drugs in convenience stores.
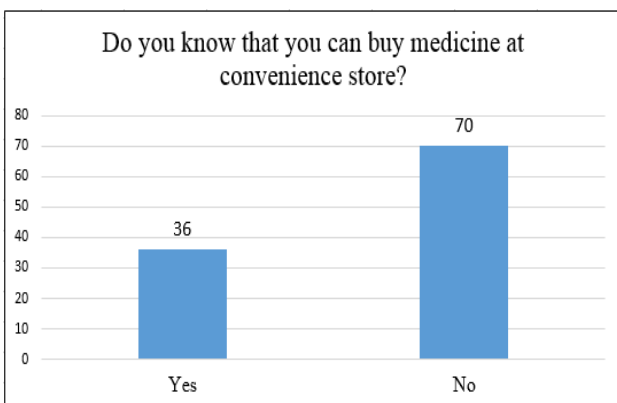

Fig. 1. Survey Result 1

The greatest reason why they did not purchase drugs in convenience stores was that they had the burden to select pharmaceuticals according to their symptoms for themselves. As the graph in Figure 2 shows, the number of respondents who answered that they would purchase pharmaceuticals in convenience stores if information on t he drugs they sold was provided to them was 63 accounting for 59%. The number of respondents who answered that they would use a drugstore due to lack of confidence in information on dr ugs sold by convenience stores was 43 making up 41%.
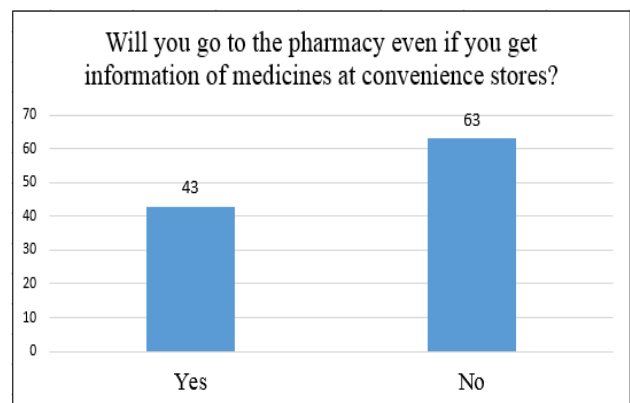

Fig. 2. Survey Result 2

Ninety six percent, or 102 respondents, answered that they were willing to utilize an application providing information on s tores selling drugs. Figure 3 i s a graph showing the above information.
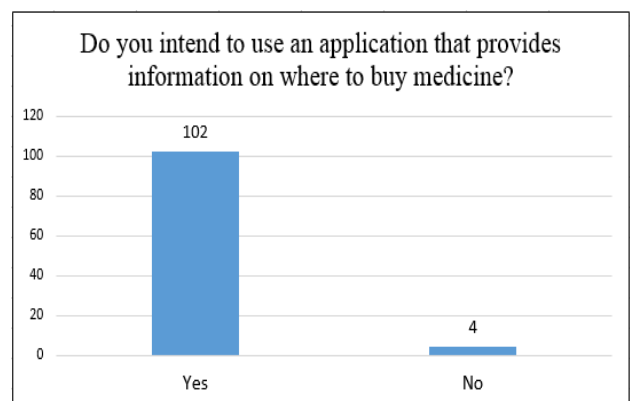

Fig. 3. Survey Result 3

According to the result of the survey, there were many who underwent discomfort because there was no drugstore nearby and who did not take medicine within the set time even though they took drugs. In addition, the respondents

demanded additional functions like providing information on the side effects of drugs and effects of drugs and asking physical symptoms to experts and getting answers for them. Further, they demanded that when the information about the convenience stores selling drugs was provided, there be functions to notify the kinds of pharmaceuticals sold. Accordingly, the application for searching stores to sell general pharmaceuticals embodied in this study included alarm function, function of counseling with experts, and function of providing measures in an emergency situation.

2.2 Benchmarking
There were many applications that provided information about stores selling pharmaceuticals and they included "Goodoc," "ggobacggobacyakalimi" (meaning notifying when to take medicine on a regular basis), "provision of emergency medical information," and "my drugstore." The application of "provision of emergency medical information" in Figure 4 w ell provided information about how to cope with emergency situations, and had precise location information and explanation. It also provided information about drugstores that opened on holidays. Nonetheless, it did not provide information on sales of pharmaceuticals by convenience stores and its update was late.
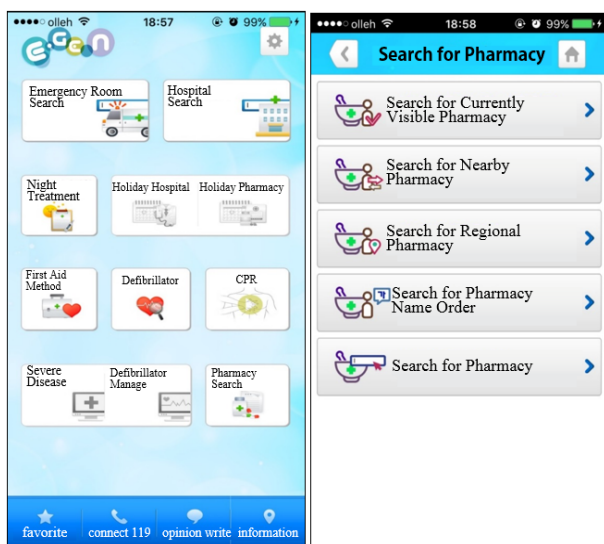

Fig. 4. "Provision of Emergency Medical Information"
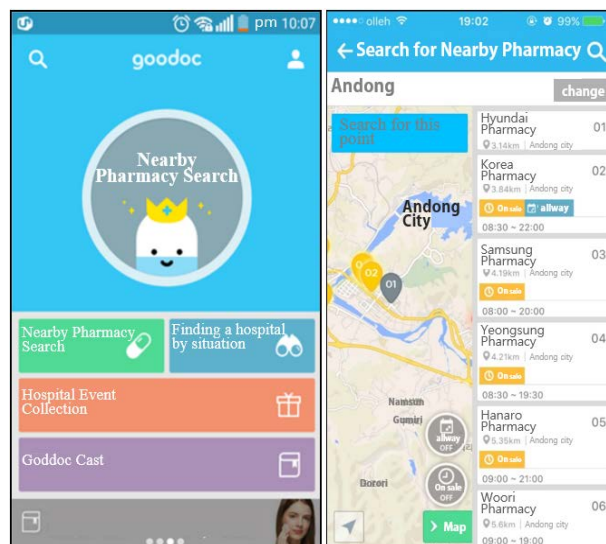
Figure 5 shows the "Goddoc" application.

Fig. 5. "goodoc"

"Goddoc" was precise in location information and explanation, provided the function of counseling by doctors, hospital reviews, and giving star points to stores. Nonetheless, it lacked advertisement for promotion and preciseness of information provided.

Besides, "ggobacggobacyakalimi" notified the time to take medicine but there was no other special function. According to the result of benchmarking many applications providing information about drug selling stores, functions that received good responses included "drug store finding during holidays," "alarming about when to take medicine," "emergency situation measures," and "counseling with experts." However, no application provided information on convenience stores' pharmaceutical sales. Accordingly, this study embodied functions that received good responses as maximally as possible and added a function to provide information on dr ug sales by convenience stores.

3 Design
3.1 Structure Design
The application to search for general pharmaceuticals embodied by this paper has six categories of "signing up," "finding stores that sell drugs," "notification," "measures for emergency situations," "expert counseling," and "information board." Figure 6 shows a system top-level diagram that represents categories of the six functions.

Fig. 6. System Top Level Diagram

The key function of the application embodied in this paper is the provision of information on s tores that sell drugs. Figure 7 displays a data flow diagram on the function to find stores that sell drugs. The function of finding stores that sell drugs involves provision of the locations of drugs stores and convenience stores and information on pharmaceuticals. This function is to provide information on pharmaceuticals sold in nearby convenience stores and location and information about drug stores that open during holidays and location of nearby drug stores.
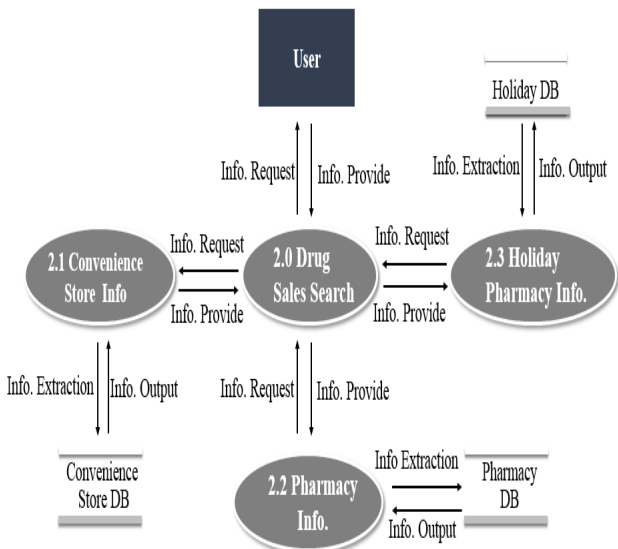

Fig. 7. "Drug Sales Search" DFD

Figure 8 shows the overall structure chart of the system, which shows the functions defined and relationship among the diverse functions.
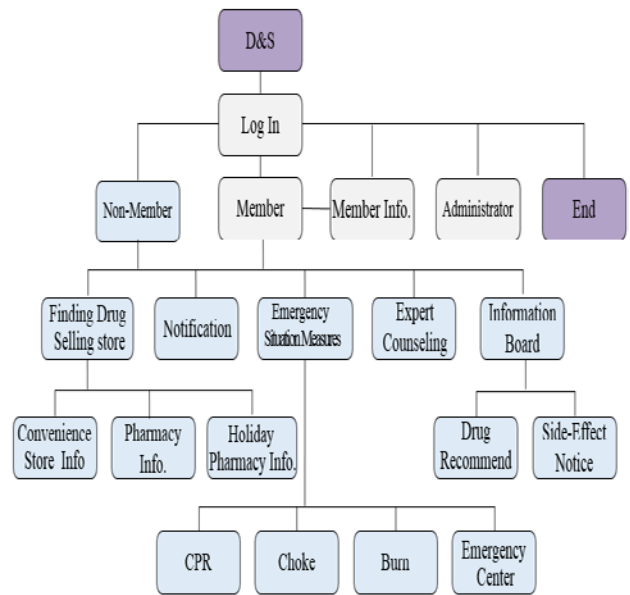

Fig. 8. System Flowchart

Signing up is needed to utilize a few functions of this paper's application. Figure 9 displays the flow chart of the "signing up" function. The procedure for signing up w as simplified by making it possible to function through the inputting of simple information and when the result of overlapping test in UserDB was "true," movement to the log-in page was made.
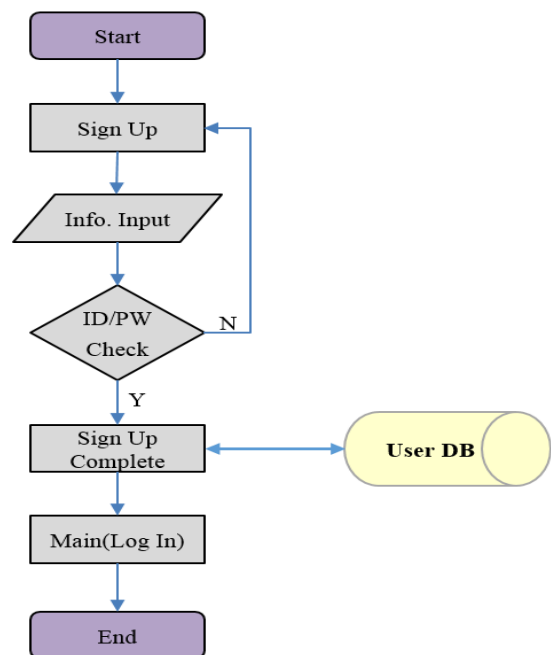

Fig. 9. Flowchart of "signing up" function

The outcome of "finding drug selling stores" is marked on the map in interoperation with the Google map. Figure 10 illustrates the flow chart of the function "finding drug selling stores." When the name of a drugstore or a convenience store is input, the outcome is marked on t he map and the information on t he searched location and distance are informed.
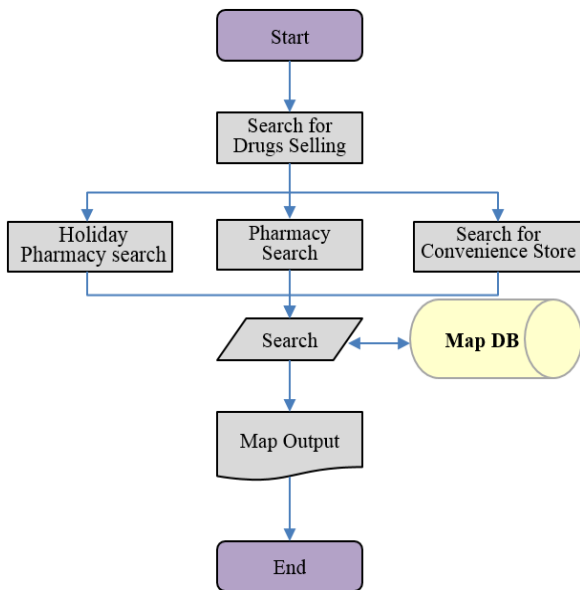

Fig. 10. Flowchart of "finding drug selling stores"

3.2 UI Design

The application embodied in this paper provides information by differentiating the condition of being logged in and the condition of not being logged in. Figure 11 s hows user interface on the screen when the user has logged in. A member may also utilize "counseling with an expert" and "bulletin board." Even though a user does not log in, information provided in the application is given to the user and for signing up, minimal information is input.
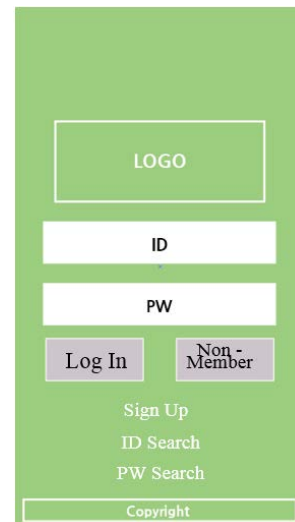

Fig. 11. UI Design for "Log In"

Figure 12 is a user interface design with a function of registering an expert in order to provide the function of counseling with an expert.
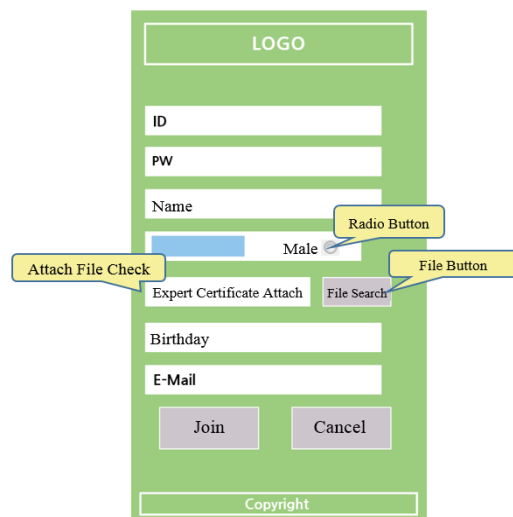

Fig. 12. UI Design for "Registering an Expert"

When the application user requests counseling, it is stored in the database for questions and answers and a counselor registered as an expert can provide an answer. When an expert attaches his or her certificate and gets certification about his or her certificate, he or she is empowered to answer the counseling. It may be inconvenient to make certification through a certificate, but it w as necessary because provision of incorrect information related to drugs or emergency measures may be fatal to health.

As an additional function, an "alarm function" that informs when to take medicine is

provided. Figure 13 displays the user interface design for the alarm function. An alarm may be set for the time to take medicine purchased. The design is made so that multiple alarms may be added and the list of registered alarms is shown.
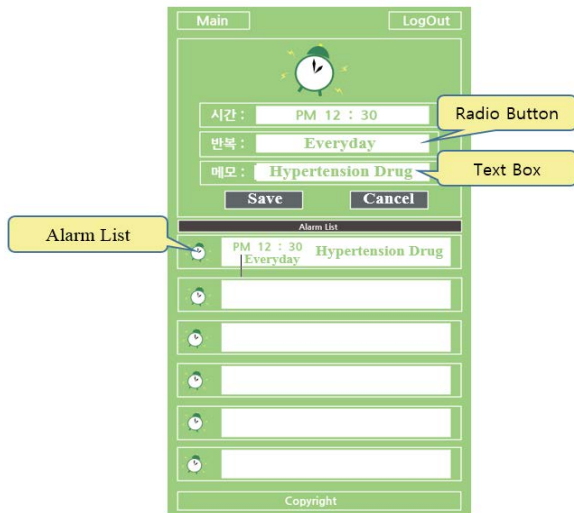

Fig. 13. UI Design for "Alarm Function"

Figure 14 shows the user interface design with "a counseling and answer bulletin board." On the bulletin board, members can exchange information on their life and health. The content written by other members may be read by anyone but the answers may be given by members only; the answers for the counseling questions may be given by members certified as experts.

Fig. 14. UI Design for "Counseling & Answer Bulletin Board"

4 Implementation

The general pharmaceutical search application embodied in this paper provides necessary functions only, with a simple design, in consideration of users' convenience and the small screen of a smart phone. For its embodiment, an app inventor was utilized. The app inventor is a program that enables app development in android-based cellular phones or emulators [11]. It is applied through the chrome browser and therefore does not need an installation program and may be utilized easily by anybody by performing programming using blocks [12]. Figure 15 displays a screen embodying the intro screen and main screen. In order to heighten accessibility by diverse users, a mere logo for the intro screen was arranged. For the main screen, in the upper end, a search window that can search functions that applications have and in the lower end a button connected to functions was arranged.
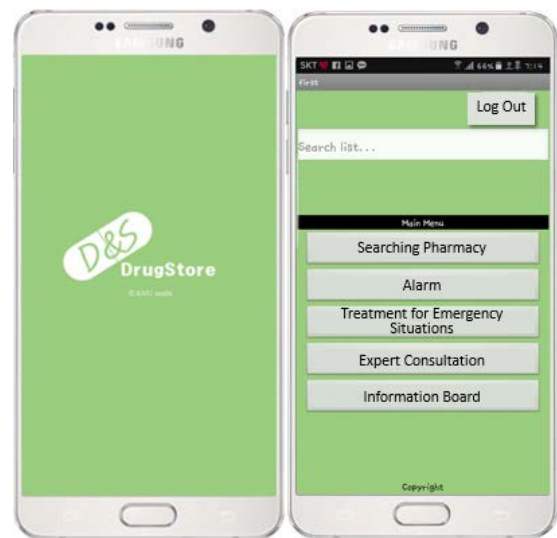

Fig. 15. "Intro Page" and "Main Page"

The most important function of the general pharmaceutical search application is to provide information about stores that sell general pharmaceuticals. In addition, information on basic measures to be taken when an emergency occurred was also provided. Figure 16 illustrates a screen that embodies the functions of "drug selling store finding" and "emergency situation measures." "The drug selling store finding" function informs nearby drug selling stores in interoperation with GPS function when a user inputs information on company names or medicine. The distance to the searched area is provided in interoperation with the Google map. The function of "measures against emergency situations" provides how to respond to emergency situations with high frequency such as cardiopulmonary resuscitation, burns, or suffocation. In addition, it provides direct link to an emergency medical center.
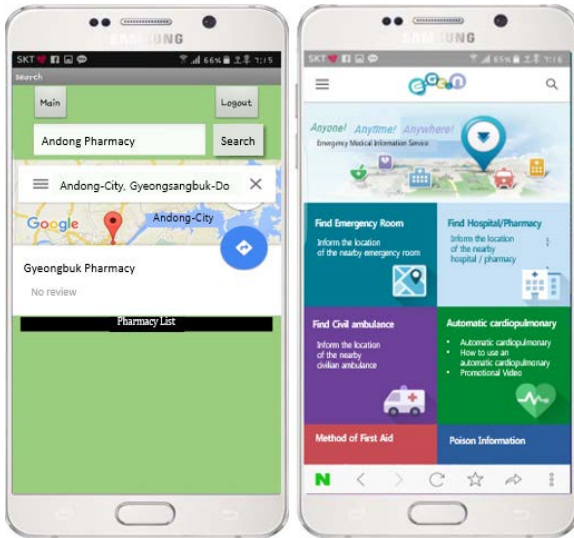
Fig. 16. "Drug selling store finding" and "Emergency situation measures"

In the program provided by this paper, the Good map is interoperated in order to find drug selling stores. Figure 17 shows a chart of app inventor block aimed at embodying the function of "finding drug selling stores." For interoperation with the Google map, WebViewer was used. WebViewer is a component that shows a browser screen within an app, it can show any web page including the Google map, and it is possible to transfer web pages http://maps.google.com/?q was linked using the WebViewer [13].
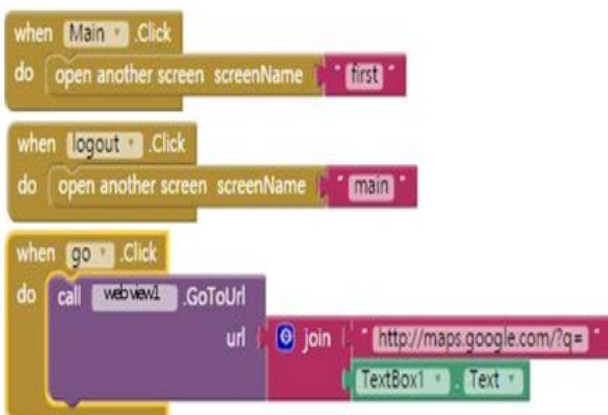

Fig. 17. App Inventor block for "Search for pharmacy or drug sellers"

Figure 18 illustrates the chart of app inventor block in order to embody the function of "emergency situation measures." In the "emergency situation measures" function, emergency situations occurring frequently were

defined using "label" components. URLs of sites providing information on a ppropriate measures for each label were linked using WebViewer. Direct link with an emergency medical center was made using the ActivityStarter, a component that can implement other apps in the app. In this paper, link to the page "Central Emergency Medical Center" is made.
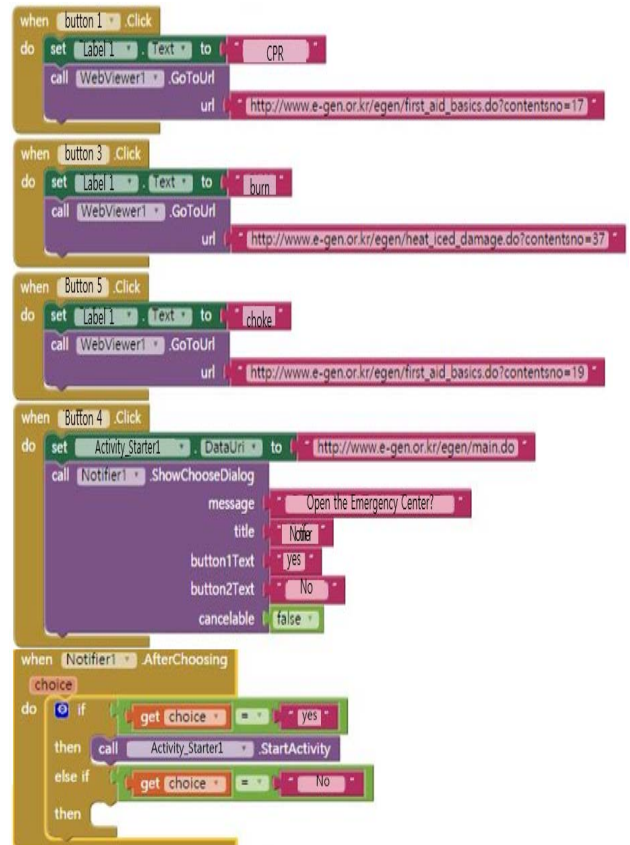

Fig. 18. App Inventor block for "Screen of Emergency Situation Response"

5 Conclusion

Drugs are directly related to health and when a symptom is not severe, it can be cured with mere drugs, not visiting a hospital. In actuality, an ordinary person takes medicine once to twice per six months. Although the locations where one can purchase drugs were expanded to retail and convenience stores in addition to drug stores, information about those stores is lacking. Accordingly, this paper designed and embodied an application that gives information on purchase of general pharmaceuticals. The application embodied in this paper informs the locations of retail and convenience stores that

sell drugs as well as drug stores and provides information about medicine sold by these stores. This application is expected to reduce unnecessary time spent and cost incurred in users due to lack of information about drug selling stores. Nonetheless, it was tricky to collect precise information because the number of convenience stores was so large, and it was difficult to obtain users because there were already applications that provide information on drug stores. Future research will examine measures to automate information collection and methods to make differentiation from other applications, thereby adding other functions.

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