A Guideline for an Outpatient Guidance System for Use in General Hospitals

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Abstract. This paper presents a guideline for a hospital guidance system that provides outpatients with guidance about their process and location. When visiting general hospitals, outpatients often encounter difficulties in understanding the hospital process and in knowing where to go next during that process. To address this issue, we initially conducted an ethnographic interview of fifteen outpatients to determine their needs, interviewed hospital staff to discover exceptional cases, and then analyzed the hospital process for outpatients to uncover any timing difficulties so as to specify the proposed guidance service. Considering the findings of the user study and the result of a domain analysis, we formulated the outpatient guidance service. The outpatient guidance system is presented here as an example.

Keywords: Outpatient guidance system, General hospital, Outpatient services, Process, Location.

1 Introduction

When visiting public hospitals, outpatients often experience difficulties in understanding where to go and what to do. Although hospital personnel are ready to provide necessary guidance, they cannot always address the difficulties of all outpatients because these issues are very diverse.

Context-aware computing has appeared as a viable means of providing proper guidance to users in difficulty. In an attempt to provide guidance based on a user's context, researchers who study Location-based Service (LBS) have suggested several systems that give information relevant to a user's current position [1, 2]. Location-based information can be helpful to users in these circumstances, but these systems are limited in terms of their ability to provide more customized guidance to a user requiring a personalized process. Han [3] presented a spatiotemporal context-aware system that guides users considering both the user's location and process, but it is targeted for public places; therefore, it is too general to meet the expectations of outpatients in general hospitals.

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Several context-aware guidance systems in hospitals have been developed. A location-aware hospital system [4] was implemented to give patient information to hospital workers, and a context-aware nurse call system [5] was designed. However, these systems are designed for hospital staff only. For outpatients, a patient guidance system [6] was suggested which gives guidance about a user's current step in the hospital process. It can provide them with their waiting number on electronic paper. However, this patient guidance system only considers a restricted set of process conditions; hence, its functions are too simple to cover the wide variety of needs patients typically have.

In this paper, we present a guideline for an outpatient guidance system for general hospitals. To understand a user's difficulties in general hospitals, we used relied on observations and interviews and then analyzed the process used by outpatient services. With the results, we defined the necessary guidance services for outpatients.

2 User Study

A user study was conducted to determine the difficulties encountered by people when they visiting a general hospital as an outpatient. To gather this information, we relied on ethnographic interviews [7] that included user observations and general interviews. In order to determine the proper outpatient services, we conducted direct observations and interviews of outpatients. Subsequently, subject-matter expert interviews were done to discover any unusual or abnormal situations that were not perceptible in the observations.

2.1 Ethnographic Interview: User Observations and Interviews

Setting. Observations were done in a general hospital in an effort to determine the types of difficulties. This method also helped to define the types of guidance that should be provided to users. The observations were performed using an ethnographic method of the type typically used to evaluate the behavioral patterns of subjects. To establish the difficulties encountered by outpatients, the observation procedure was performed at *Seoul National University Bundang Hospital*, which is one of the leading hospitals in Korea due to its state-of-the-art digital infrastructure. There are 3,600 outpatients who visit to the hospital every day. However, there are only about 35 guides to assist them, implying a workload of approximately 100 outpatients per guide per day.

Participants. We observed five male and ten female outpatients who used the outpatient services of the hospital. The average age of the outpatients was 56, and they had visited this hospital 2.8 times on average.

Method. The observation proceeded throughout the overall outpatient experience, from reception to their last service, such as making a payment. The observations continued for 120 minutes on average. The observation group consisted of two people: a helper who is an expert in outpatient services, and an observer who transcribed all of the difficulties experienced by the subjects while observing from the

sidelines. In particular, we decided that the helper should not provide guidance to subjects proactively, but guide passively only when the subject had a question that required an answer. We expected that this method, assigning one helper, could help to discover more difficulties than those noted only from observations at a distance, as subjects were believed to express their difficulties only rarely. First, we obtained the consent of the outpatients that we intended to observe. We then instructed the outpatients to tell the helper immediately whenever they required help, needed support or wanted to know anything. While performing the observation, whenever the subjects encountered any difficulty, the helper assisted subjects according to their requests and the observer recorded the particular type of trouble, such as how the helper aided the subject, using a checklist that included the location, time, difficulties, and the comments of the helper. Additionally, subject interviews were performed midstream and after the observations. These were performed while waiting for the consultations or examinations, as the subjects were not always mindful of their difficulties once they had been resolved.

Findings. After the user observations and interviews, we gained an understanding of the typical user type and their difficulties. We also uncovered a number of similarities among the difficulties experienced by outpatients. Every outpatient wished to know about the process and location of outpatient services. 125 similar difficulties gathered from the result of the observations and interviews were classified into two major groups: Process-related and Location-related difficulties. To define the required guidance for outpatients more specifically, the Process-related difficulties, which represented the majority, was classified into four minor groups: Procedural, Time-related, Method-related and Content-related (see Table 1).

1. Procedural: Questions such as “What do I do next?” and “What is my entire process?” are included in this category. Thus, difficulties related to the process were classified into this category. 18 (14.4%) of the difficulties were classified into this category.
2. Time-related: Difficulties related to the waiting time, last visiting date, next visiting date and appointment time are classified in this category. 22 (17.6%) of the difficulties were classified into this category.
3. Method-related: This category contains difficulties in using equipment or performing a task, such as how to use a payment machine or whether a patient should take off his/her shirt for an X-ray examination for instance. 24 (19.2%) of the difficulties were classified into this category.
4. Content-related: In many cases, the observations revealed that outpatients wanted more information in greater detail about their examinations or illnesses. Occasionally, they were also unclear about how much they had to pay. 18 (14.4%) of the difficulties were classified into this category.
5. Location-related: As is the case with people in many complex places, it was found that the outpatients in this study typically had difficulty finding their way around the hospital. Furthermore, it was found that they commonly experienced some difficulties with this even when maps were provided. 43 (34.4%) of the difficulties were classified into this category.

Table 1. Five categories of difficulties

CATEGORY	Procedural	Time-related	Method-related	Content-related	Location-related
Numbers of cases (%)	18 (14.4)	22 (17.6)	24 (19.2)	18 (14.4)	43 (34.4)

2.2 Subject-Matter Interviews: Hospital Staff Interview

Settings. Subject-matter expert interviews were done to discover any unusual or abnormal situations that were not perceptible in the observations. Seven faculty members who were interviewed had worked at various stations of *Seoul National University Bundang Hospital* for 11.8 years on average as of the date of this study. One from the Joint Disease & Reconstruction Center, two from the examination department, one from the reservation desk, one from the reception desk, and two from the information desk.

Findings. From the interviews of the hospital staff members, we discovered exceptional situations that were not found during the observations. Examples include a guardian's information handover problem, a schedule change problem, missed appointments, a different person with the same name, and a fasting-related problem. These problems should be also covered by a guidance service, as should the difficulties noted from the user observations.

3 Hospital Domain Analysis for Outpatient

To determine the timing of the difficulties and specify guidance services, we first analyzed the hospital process for outpatient services. This analysis was conducted in conjunction with a medical information team at *Seoul National University Bundang Hospital*. Figure 1 shows a flow chart of the outpatient services offered at this hospital. Generally, outpatients have at most nine service steps to complete their goal, and the service steps can be reduced according to their situation. To finish each service, users should perform an average of four tasks.

Movement is the most common task that outpatients have to do. Whenever services are finished, outpatients should find their way to the next service. Moreover, when outpatients want to go a specific place that is not an outpatient service place, it is more difficult for them to find their way by themselves when they have not received any guidance from the staff. Therefore, location guidance is the most essential guidance service for outpatients. Second, guidance to the next service and task is necessary for outpatients because there are many prioritized services and tasks that patient should perform, and the priority can change in special cases. In addition, the current day's schedule should be provided because the outpatient service procedure can be long and varied after the initial consultation. Third, it is important to provide information related to waiting and reservation times, as outpatients spend most of their time waiting for their turn. Finally, a sufficient explanation of an outpatient's current service is necessary. Particularly, when they use the payment and examination services, we found that many outpatients do not know what they are paying for or why they must take some tests.

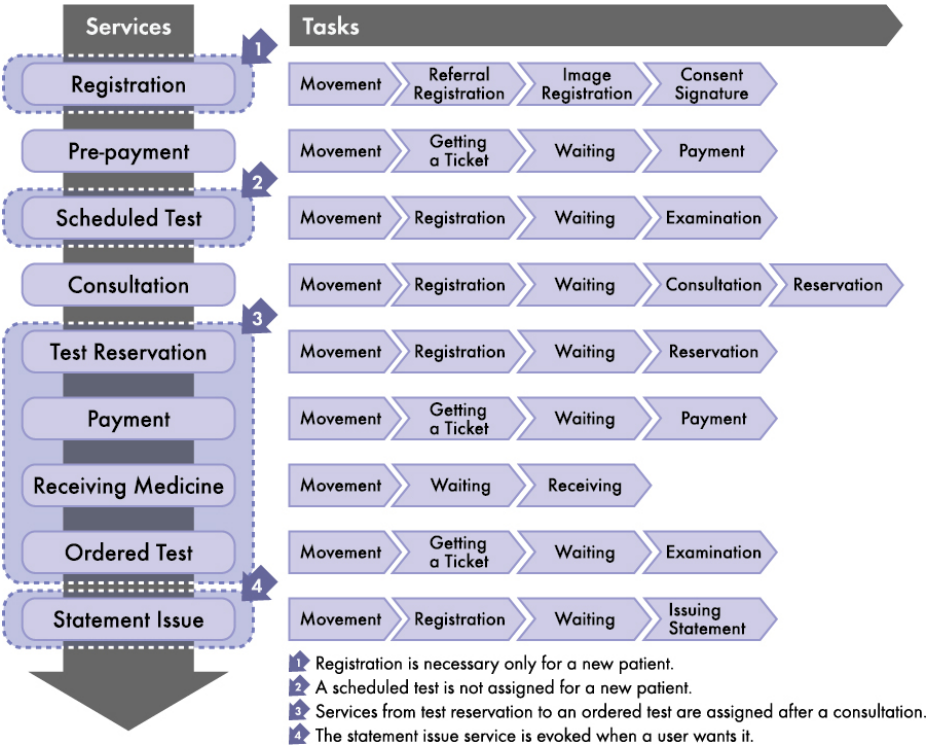


Fig. 1. Flow chart of outpatient services

4 Outpatient Guidance Services

Based on the five categories of difficulties and the result of the hospital domain analysis, we designed hospital guidance services for outpatients (see Figure 2). Guidance services for the procedural, time-related, method-related, and content-related difficulties are grouped into process guidance that includes task, notification, schedule and detailed information guidance. In addition, location guidance is defined for the location-related difficulties related to the next destination and guidance to a specific place.

Process Guidance. The goal of process guidance is to enable outpatients to understand the current services and to know precisely what to do. Process guidance includes task guidance and notification guidance as primary types of guidance, as these are essential for outpatients to follow the hospital procedure. Moreover, schedule guidance and detailed information guidance are given as extra types of guidance that outpatients may want.

Task guidance provides information about an outpatient's current service and guides the user to complete the current task so that the outpatient can understand where he/she is in the process and know what to do at that time. Figure 3a shows an example of task guidance in a test service. As regards task guidance, outpatient guidance systems should be able to understand a user's current service and the task steps in the service.

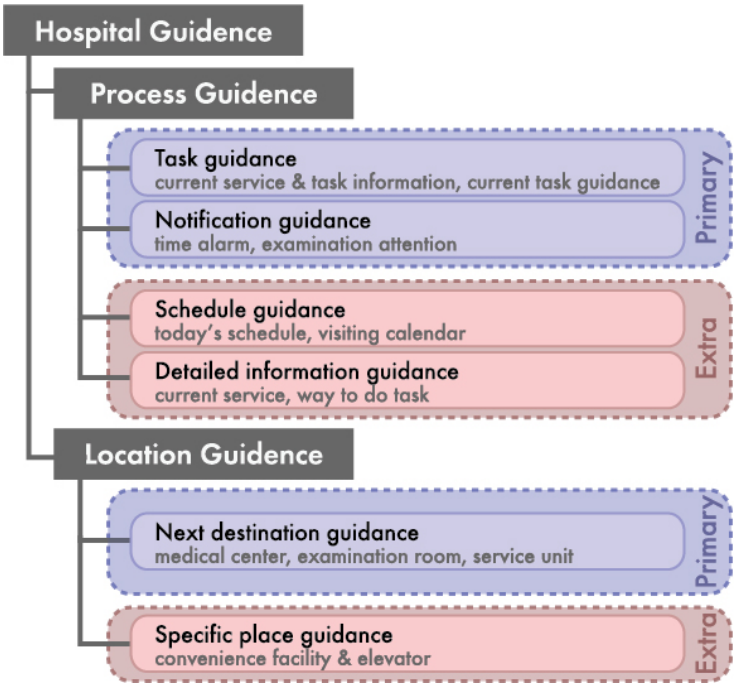


Fig. 2. Hierarchy of outpatient guidance services

Notification guidance proactively sends important messages in the form of alarms that outpatients should recognize. This notification prevents outpatients from missing their turns or violating instructions such as fasting before an examination. For example, when user is called for his turn but the user is not in the waiting room, a notification message with an alarm, such as vibration, is delivered. For notification guidance, guidance systems should monitor the user's context-related time or examination time.

Schedule guidance informs patients of the current day's procedures and hospital visit date, including past and/or reserved appointments. Outpatients can check their remaining services and anticipate the time they will need with schedule guidance.

Detailed information guidance gives more detailed information about the current service or shows patients how to do tasks. Outpatients can obtain more information about their services, such as information on his/her doctor, test process, or payment items. With this information, outpatients can understand why the services are necessary.

Location Guidance. Location guidance is essential because outpatients should move to the next service place whenever a service has finished or when they are looking for a specific place, such as a toilet. Although there are many signs and maps in hospitals, it can be difficult for outpatients to find the necessary signs or to understand guide maps. Therefore, two types of location guidance are required: overall location guidance such as maps, and detailed location guidance such as signs.

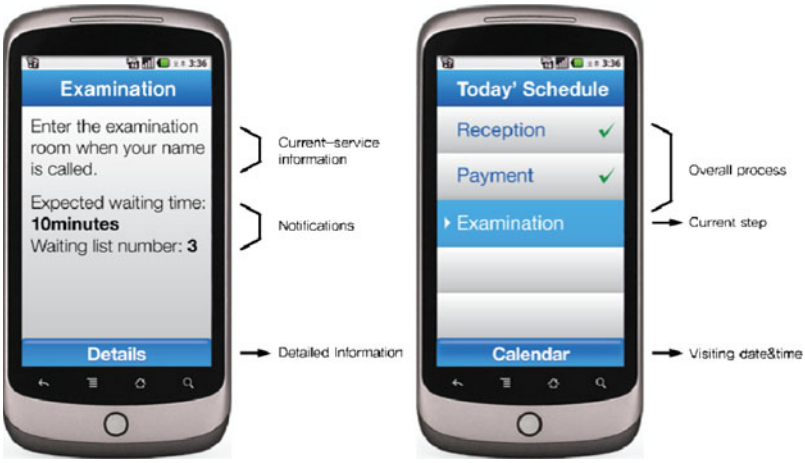
Next, destination guidance provides a path from the current position to the user's destination. When a service is finished and a new service is set, guidance systems should be able to recognize a new destination automatically and start to provide guidance to the next destination.

Specific place guidance is not primary for hospital services, but this guidance is useful because many of the outpatients in our user study asked about the locations of convenience facilities and elevators. In particular, there is much waiting time in hospitals, and outpatients often want a specific place to go to wait.

5 Example: A Hospital Guidance System

To describe a more tangible guideline, we illustrate a hospital guidance system using a mobile phone with two guidance modes: process and location guidance. According to the guidance hierarchy, the process guidance mode describes guidance information about Schedule, Task, Notification, and Detailed information guidance. The default page of the process mode gives current-service information and notification messages such as the waiting time (see Figure 3a), and the overall process page shows the current day's procedures along with the current step. Furthermore, patients can check the schedule for a reserved examination or for other information (see Figure 3b). The location guidance mode was also designed to have two pages: the current view and hospital map pages (see Figure 4). The current view page displays a picture with an arrow that is used to inform a patient as to whether they should turn or go forward; the hospital map page shows the overall route for the next destination or specific places such as toilets.

The user interface of a hospital guidance system should be designed for the elderly, because a considerable number of patients are older people; moreover, the size of the text should be large enough for the elderly to read it, and the method of changing the page should be very simple.



(a) Current service page (b) Overall process page

Fig. 3. Pages of process guidance mode

Fig. 4. Pages of location guidance mode

6 Conclusion and Future Works

We introduced a guideline for an outpatient guidance system that provides outpatients with guidance about their process and location. With the increased popularity of smart devices such as smart phones and tablets, the need for personalized guidance in complex environments has increased. Particularly, in general hospitals, outpatients should pay attention and follow passively the directions of hospital staff owing to the current shortage of human guides or guidance systems. As the situation currently stands, outpatients pay occasionally without any information about the payment items. We believe that the proposed outpatient services will be helpful to users and that applying this guideline can make hospital guidance systems more intelligent and effective.

To reinforce our guideline, first we are planning to conduct long-term user evaluations in the near future. We expect that these evaluations, with mobile devices, will help uncover new difficulties and solutions. We also plan to research context-aware methods to understand users' situations in hospitals, as some difficulties cannot be covered due to the limitations associated with context-awareness; for example, some services are not updated in real time regardless of whether or not they are finished, causing the system to infer with the situation by combining the user's locations. We hope to overcome these limitations in future research.

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