A Study on the Interface for Viewing the Information Menu of a Town from Intersections Using a Digital Compass

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Abstract. Recently, services providing information content that meet the needs of a user's current location, based on location information obtained by mobile terminals such as cell phones, have been increasing. In line with the widespread use of these Location-Based Services (LBS), digital compasses that obtain bearing information together with location information are also emerging. By using the digital compass with the location information, a higher level of information can be produced. In this paper, a "XingMenu Viewer" for viewing the information menu of a town from intersections using a digital compass is proposed. In the town exploration experiment using this viewer, it was observed that the exminee's perception of the town had expanded.

Keywords: Location-Based Services (LBS), Mobile Computing, Digital Compass, Augmented Reality, Photo Sharing, Live Blog, Cognitive Map.

1 Introduction

Information communication technology has created a new living environment, which we refer to as "virtual." The physical living environment and the virtual living environment are separated by humans. In the virtual living environment, it is possible to contact friends and acquaintances without worrying about time by using mail or SNS, and by going to photo sharing sites, one can look at pictures of far-off places without going on an overseas trip. However, the perception of time and place that dominate the physical living environment are extremely subtle in the virtual living environment.

On the other hand, virtual information increases human perception of the real world, extends memory, and allows people to share their experience with others. The location information services connecting the physical and virtual are a new media, called "Place Media" [1] (Fig. 1), that uses location as its base. As one of the Place Media, this paper is proposing the "XingMenu Viewer" (hereafter, XV) for viewing the town's information menu from intersections, which is a town node [2] using a digital compass.
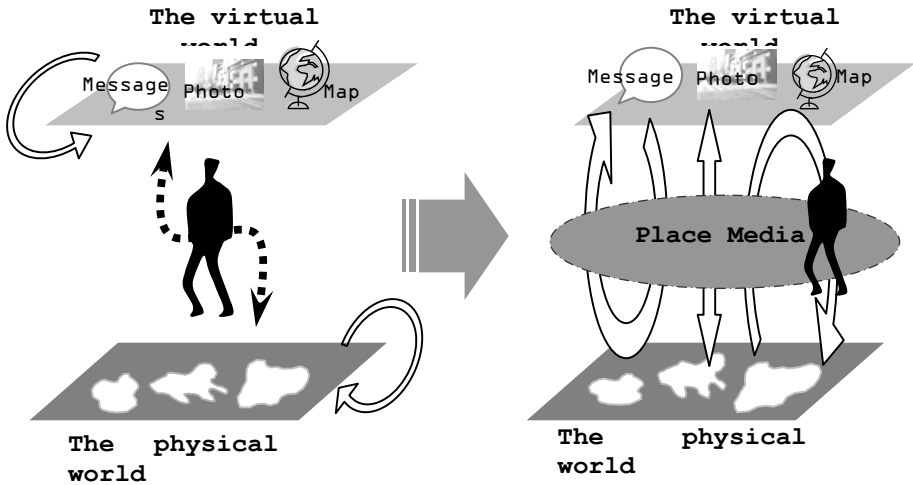
Fig. 1. The virtual and physical worlds

2   XingMenu Viewer

2.1   System Overview

The XV system configuration diagram is shown in Figure 2. The XV operation is as follows.

1. Obtain the location and bearing information using mobile terminals installed with GPS and digital compasses and grasp the direction facing the intersection in which the user is located.
2. Together with the information obtained in 1, decide on the displayed scenery data and contents, and send the queries to the server.
3. The server will query the contents database and scenery database and call forth the corresponding contents and scenery data.
4. The contents and scenery data will be composed and displayed at the terminals.

2.2   Concept

The XingMenu Viewer concept is shown in this section. XV is an interface superimposing the virtual information to the physical town scenery that a user is looking at, at an intersection. This is a function that supports the interaction between people and town, a function that especially expands people's perception of a physical town [1].

In the virtual world, keyword searches are very typical, but the volume of virtual information has become so large that it is sometimes difficult to get the required information. It has become easier to find preferred information when refining is done using a menu search, In physical reality, when sightseeing, people will go to a high spot that overlooks the whole place, especially when visiting for the first time. At the same time, they will superimpose the knowledge gained from guidebooks and maps
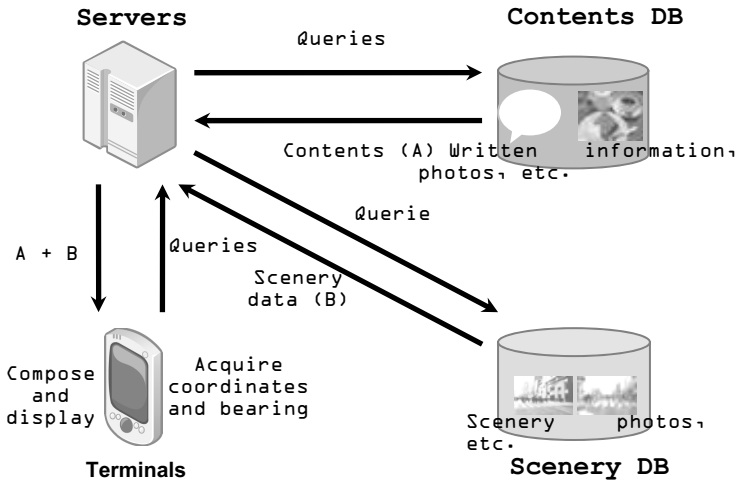
Fig. 2. The XV System

onto the physical scenery. This is the spontaneous drawing of the town's information menu in the brain. XV is an item that visualizes the town's information menu, which existed only in the minds of people until now, and enables a menu search when sightseeing (Figure 3).

2.3 AR and SR

A method that superimposes virtual space onto physical space and displays additional information there, as in XV, is known as Augmented Reality (hereafter, AR), and has been getting attention recently[3].
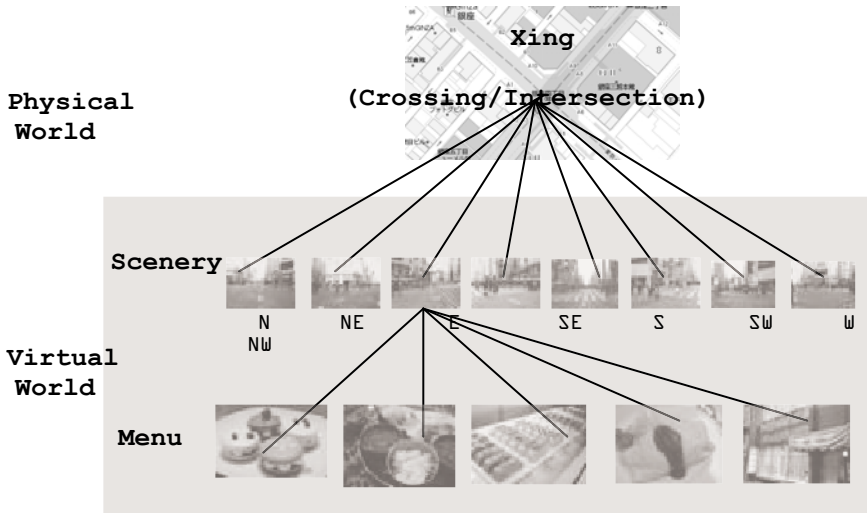

Fig. 3. The menu-search sightseeing by XV

Fig. 4. The sample screen of XV

Even now, information for users that refers to the physical town is overflowing. Information on train trips and coupons that can be used for shopping that matches the real world actual state and individual users' preferences, transmitted by NTT DoCoMo service "iConcierge" [4], is also a part of it. XV is an interface to access information by looking at the town from intersections with the introduction of the AR concept. An example is shown in Figure 4. Because iConcierge provides information deeply rooted in the living community and personal preferences, it is very convenient when there is a specific objective. On the other hand, XV may be more suitable for users who "walk without any destination in mind," looking for favorite shops while enjoying their sightseeing than it is for those with a clear objective in mind.

On the other hand, recently, a phenomenon of public users taking large numbers of photos and publishing them on the Internet is occurring, due to the effect of prevalence of digital cameras and camera cell phones in the society. Countless scenic photos of towns taken by users walking or visiting are being uploaded to photo-sharing sites such as Flickr [5] and Picasa [6]. The physical scenery of every town in the world is being provided by the many users of the Internet.

Furthermore, together with the prevailing blogs and SNS, the number of people creating so-called live blogs, the recording of daily lives and happenings with photos and messages attached to them, is also increasing. Town scenery photos with live blogs are combined and uploaded together by users and then shared in the real world, and a method that expands the perception of the real world in the user is proposed. This is an approach, as opposed to the AR, we call "Shared Reality" (hereafter, SR).
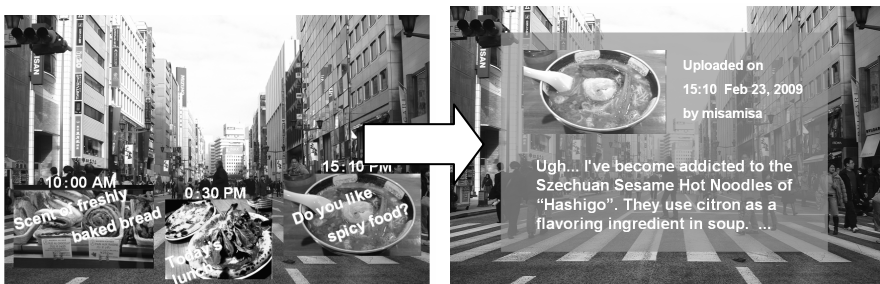

Fig. 5. The sample screen of XV by SR

An example of XV using the SR approach is shown in Figure 5. In this figure, on the left, the same are recorded at different times, in other words, a pseudo-synchronized live blog is presented. From the pseudo-synchronized live blog, one can get a glimpse of the movement of someone who had been in the same place, but at different times, and can identify with each other.

3   Town Exploration Experiment

The town exploration experiment in Ginza, Tokyo, using XV is reported in this section. It analyzes how the movements of someone who is exploring the town are changed by XV.

3.1   Prototype

The prototype scenery photos were taken by the author at a Ginza intersection. Further, because the information content is about shops like the ones provided by DoCoMo iConcierge, taken from the magazine "Ginza Walker" [7] and not the users' live blogs, the prototype approach is categorized as AR, not SR.

The location coordinate was fixed on either one of the intersections at Ginza 2, 4th or 6th Street, and when the examinee operates the XV, the intersection where one stands was specified, and the bearing information was obtained in real time. Further, because there is no suitable terminal with a highly accurate digital compass installed in reality, a notebook connected to a GPS receiver (geko 301, Garmin product) was used.

3.2   Experiment Summary

Five examinees who never visited Ginza were selected. First, the examinees, in pairs or alone, performed a task called "selecting a restaurant for lunch while walking aimlessly around the town" without using any sightseeing assisting tools such as guidebooks or cell-phone navigation functions. At the point when the examinees decided on the restaurant, the sightseeing was halted and the task of creating the Ginza cognitive map, depending only on the memory during the walk, was carried out.

After lunch, the sightseeing was reconvened using XV. Now, the "Choose a cafe, or tea shop, or cake shop for a short rest" task was performed. After the examinees decided on a shop, the task of redrawing the cognitive map in a form of writing on top of the cognitive map drawn before using the XV was carried out. Relating to the sightseeing in particular, there was no time limitation in place, but the time required was 1 hour on average for each map, so there was a total of 2 hours sightseeing.

4   Experiment Results and Discussion

The cognitive maps drawn by the examinees are shown in Figure 6. Furthermore, from the composition elements of the cognitive map shown by Lynch [2], each part of the cognitive maps drawn were categorized and organized into four types: paths, nodes, landmarks, and districts (Table 1).
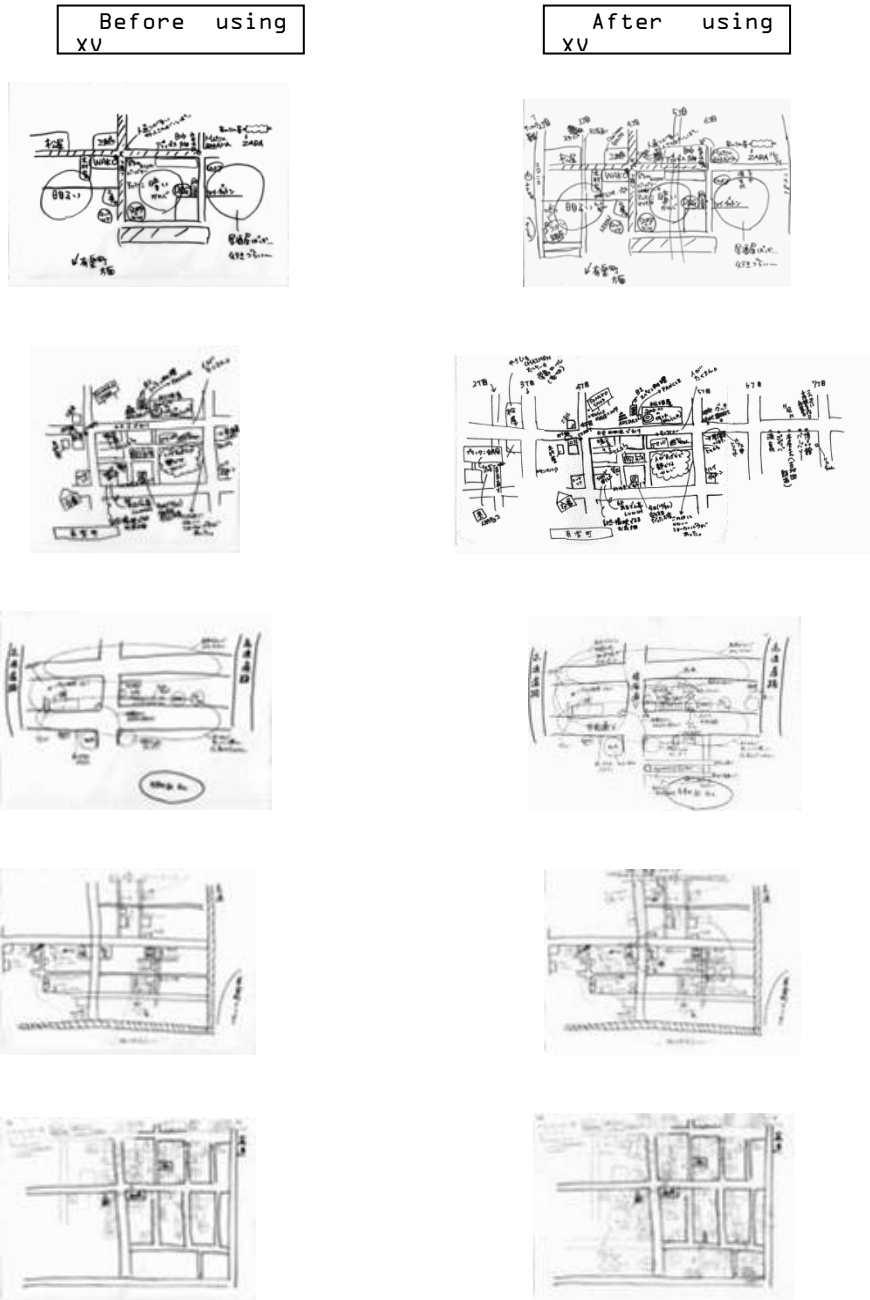
Before using XV	After using XV

Fig. 6. The cognitive maps drawn by the examinees

In Figure 6, when visually comparing the cognitive maps drawn before and after using XV, almost all the descriptions, such as "X Street" and "X Avenue," can be

seen in the cognitive maps only after using XV. One of the examinees commented on this, saying, "When using XV, it's getting to feel natural saying X (shop, e.g.) is on Y Street, X is on Y Avenue." This is thought to have been caused by the fact that all Ginza's main intersections, including the intersection where the XV operation is conducted, are named "Ginza X Street Intersection Point," and all the roads copied onto the XV scenery photos are described with names such as "XX Avenue." As a result, many of the examinees have given impressions such as, "With XV, we know where we were and our geographical perception has become better." Among them, there was even a examinee who added, "By knowing my current location, I feel safe."

On the other hand, a point that should looked at more closely in Table 1 is that all the examinees are cognizant, one way or the other, of all the items, "paths," "nodes," "landmarks," and "districts," even after using XV. When restarting the sightseeing again after an hour, it will usually be boring, and new discoveries will be harder to find. Nevertheless, the number of discoveries made was equal to that when sightseeing before using XV. This is believed to be caused by the fact that XV has created a trigger for things to do next, and has widened the movement range.

Table 1. The parts of the cognitive maps categorized into four types

XV	Cognitive map		Cognitive map		Cognitive map		Cognitive map		Cognitive map	
	Before	After	Before	After	Before	After	Before	After	Before	After
Paths	7	8	9	7	7	7	17	2	13	2
Nodes	4	7	4	5	2	4	16	3	17	3
Landmarks	21	22	24	22	17	11	26	22	39	28
Districts	5	0	3	0	4	3	4	5	6	3

5   Conclusion and Future Topics

In this paper, a "XingMenu Viewer" for viewing the town's information menu from an intersection that is a town's node using a digital compass was proposed, and the result of a town exploration experiment at Ginza using it was reported. From the experiment, based on a prototype using the AR method, by using XV at intersections a "reassurance", and "discovery" occurred, and as a result, it was understood that the perceptions of the town were expanding.

In the future, every town's scenery, photos, and live blogs will be collected on the Internet, and by constructing a platform to compose both of them, an XV prototype using the SR method will be implemented, further analyzing the information gained by this paper.

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