MINDROAD
Route Memory Support System using a Smart Phone

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Abstract: Ideally, when one is going to a destination when knows how to get there. But, even if one doesn't know the way in detail, having a sense of the direction and roughly how to get there is very helpful. One can also ask for directions from other people or use tools such as maps and navigation systems. However, there is always a risk of getting lost, getting given the wrong directions, or having a tool be unavailable (e.g., because a Website is down or a device runs out of batteries). Thus knowing the way to destinations is useful knowledge. In this research, we have developed a prototype system that helps users memorize the route to their destination more easily. With this system, the user first taps the starting point and the goal point in the map on a smart phone. Then, the route is shown, and views of important waypoints such as major intersections are reproduced continuously. In addition, we propose a method for automatically detecting routes that users often pass, as well as similar routes to the current one.

1 INTRODUCTION

In general, when one moves to an unfamiliar destination on foot, one often consults a map in advance and/or consults a map intermittently while going to the destination. For consulting maps, many convenient tools exist, such as Google Maps and Google Street View. However, people with a poor sense of direction may have difficulty using such tools. In addition, these tools do not make it easy to memorize the routes to destinations in advance. Even if one has studied the route carefully, when actually walking in the route to the destination, you may experience uncertainty about whether one is on the right road or has made the right turn. Even when following a map, if one makes a mistake, or confuses one landmark for another, it can be very difficult to recover from the error and get back on track. There may be a mismatch between information on a map and the landmarks that you have stored internally, and you may confuse distances based on an incorrect sense of scale on the map. Similar things can happen even if you are walking while actually looking the map. If you use Google Street View, it might be easy to figure out where to go next when one has the right view, but it may be difficult or time consuming to find the view that is needed.

In addition, there are the way-finding mobile navigation systems that based on GPS. However, such systems have problems, for example, people can't move smoothly to the destination (Ishikawa, et al., 2008).

People who have lost their way may not be able to access a cognitive map in their own brain (Shingaki, 1998). Using tools like maps, to the extent that it externalizes the way-finding task, is unlikely to encourage the development of route memory. Training is needed to build cognitive maps (Sadalla and Montello, 1989).

In order to facilitate formation of cognitive maps we have developed a prototype system, called MindRoad that helps people memorize the route to a destination more easily. In this system, the user first taps the starting point and the goal point in the map of a smart phone. Then, the route is shown, and views of important waypoints such as major intersections are reproduced continuously. In addition, we propose a method for automatically detecting routes that users often pass, as well as similar routes to the current one.

2 RELATED WORK

In one way-finding system, the system provides rou-

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te guidance, and an augmented reality view is displayed on the Google Street View (Tokusho and Feiner, 2009). The system supports the route guide by a smart phone.

In another approach, the system presented that uses images of user's place maps taken with a GPS-enhanced mobile camera phone as background maps for on-the-fly navigation tasks (Schöning et al., 2009).

Moreover, the user uses a special device called the Active Belt which indicates the direction that should be taken through vibration (Tsukada and Yasumura, 2004). Uses follow the directions indicated by the direction of vibration to reach the destination.

Recently, a system that helps people meet up at a common location has been proposed for a smart phone device to be carried and consulted while moving to the destination (William, et al., 2010). In our research we are taking an alternate approach of strengthening route memory prior to actually going to the destination.

3 PROPOSAL OF MINDROAD

This section explains the concept and the implementation of our prototype system.

3.1 System Design

In this research the use case involves searching for the route to a destination in advance of actually going to the destination. We propose a system that supports the memory of the route, and we have developed a prototype to test the concept. This system operates according to the following procedures.

(1) The map around the destination is displayed on a smart phone.

(2) When you tap on the map, the starting point is set.

(3) Afterwards, when you tap on the map, the goal point is set.

(4) The route from the starting point to the goal point is shown in the map.

(5) At the same time, the image of the starting point, the turning points on the way, and the goal point is continuously reproduced and is shown to the user. The images are presented by using the Google Street View.

As mentioned above, the system supports the development of route awareness when the map of the destination is examined in advance by continuously reproducing the views showing the landmarks. The system allows mental images to be associated with locations on the route.

3.2 Implementation

We implemented the system by JavaScript. The system acquires the map information and the location information by using Google Maps API. The latitude and longitude of the starting point and the goal point where the user tapped on the map is acquired. The system infers the route by using the latitude and longitude of the starting point and the goal point. And the system then presents the route on map. After this, the system acquires the latitude and longitude of each corner in the route to construct a set of landmarks. Views acquired from the Google Street View API, corresponding to locations on the route, are then shown as the route is followed. The view of each position is displayed for three seconds in the current version of the system. The views are displayed in order from the starting point to the goal point.

Figure 1 is an example of the display when the route from Kyoto Station to Nishi-Hongan-ji, in Kyoto city in Japan. A smart phone in the photograph in Figure 1 is HTC Desire Android phone.

Figure 1: Capture Image of the System.

3.3 Future Work

In this paper, we presented a system developed to supports route awareness by helping people to link street views to locations along a route. The future, we will develop when using the system, the roads that the user passed are preserved in a local data base used by GPS information on the smart phone. Afterwards, when the user goes to the destination the system compares the current route with past data, and a similar route to the past route is presented. Figure 2 shows the mechanism by which a similar route is acquired. First, the system store the way where the user walk usually, used GPS log. The system use that GPS log information, and when the user newly search the destination, the system presents the way that looks like the destination well.

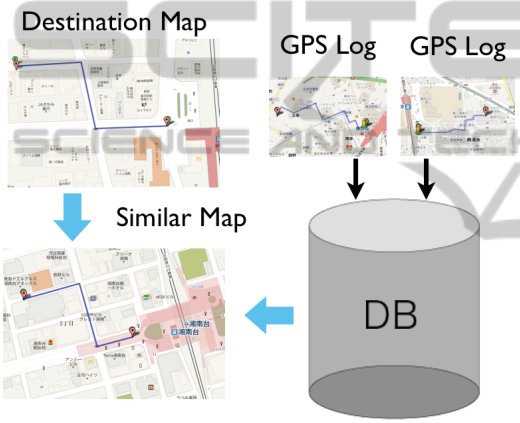

Figure 2: Mechanism for Finding a Similar Route.

4 DISCUSSION

While navigation systems using GPS information have evolved rapidly, the perfect navigation system has yet to be invented. Thus maintaining a good sense of direction remains a useful skill.

People with a poor sense of direction tend not to routinely memorize landmark and corner information (Shingaki, 1998). The system described in this paper shows continuous views along a route that are linked to corresponding locations. Using the system users can develop mental images of the route, which should strengthen their route memory.

5 CONCLUSIONS

There are many useful systems such as Google Maps and Google Street View which help people walk to destinations. But, it is not easy to memorize the way to a destination prior to departure. To solve this problem, we have developed a new navigation system which shows users the direction and also continuously shows views of important points (such as turns) along the way by tapping the starting point and goal point on a smart phone. In addition, the system also helps route memory by searching for similar routes that the person has walked previously, and showing them at the same time. Using our system, users can memorize the route easily.

In future research, we will compare the user of this system with the use of Google Map and Google Street View. In addition, future research may examine how use of the system supports the development of mental images in the brain.

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