A Branch-Type Slider and its Application

Makio Ishihara[1(✉)], Erika Koriyama[1], and Yukio Ishihara[2]

[1] Fukuoka Institute of Technology, 3-30-1 Wajiro-higashi, Higashi-ku, Fukuoka 811-0295, Japan
m-ishihara@fit.ac.jp
http://www.fit.ac.jp/∼mishihara/Lab/
[2] Kyushu University, 3-1-1, Maidashi, Higashi-ku, Fukuoka 812-8582, Japan
iyukio@redoxnavi.med.kyushu-u.ac.jp
http://hyoka.ofc.kyushu-u.ac.jp/search/details/K004222/english.html

Abstract. This manuscript proposes a branch-type slider for indoor navigation and builds a proof-of-concept system, and conducts an experiment in usability. A branch-type slider is a horizontal bar that divides into multiple sub-bars. The result shows that the branch-type slider can be applied to indoor navigation if the user interface is carefully designed.

Keywords: Branch-type sliders · Indoor navigation · Mobile application · Interface design

1 Introduction

Indoor navigation is one of the challenging topics in the field of human computer interaction. Generally, navigation is required to precisely locate the user and navigate him/her through the destination. To locate the user on the earth, the global positioning system or GPS is commonly used. The error ration of GPS is however tremendously large. It is about ∼5 meters, so GPS does not work properly for indoor navigation because the scale of corridors and stairs, doors and other things in a building is less than 5 meters. Indoor navigation needs another approach to locate the user.

There are some researches on indoor navigation. For example, Anzai, K. et al. [1] built a system that exploits the number of footsteps of the user, which are tracked by an acceleration sensor, and predicts the distance that the user walks. Nakazato, Y. et al. [2] built a system that uses a handheld camera that is attached on the top of the user's head. The camera captures the ceiling and recognizes the positons of fluorescent lights. Referring to the layout map of fluorescent lights, the system locates the user. The mainstream of those traditional systems or approaches is to figure out what way is effective to locate the user precisely in a building. The main drawback of those approaches is the prediction error caused by sensor noises and camera image noises.

There is another approach to indoor navigation. Google Street View is a good example. In the system, the user can move forward/backward or turn left/right

C. Stephanidis (Ed.): HCII 2015 Posters, Part II, CCIS 529, pp. 661–664, 2015.
DOI: 10.1007/978-3-319-21383-5_111

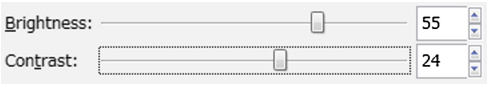

Fig. 1. A common slider.

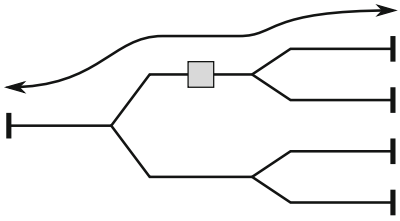

Fig. 2. A branch-type slider.

freely in an augmented virtual world. By doing this, the user is able to build a mental model of the 3D map and picture the way to the destination intuitively. This approach can be easily applied to indoor navigation because it does not need to locate the user in a building. The main drawback of the approach however stems from the style of controls. To move from the start to the destination, the user has to point at the next spot to go. This way hinders the user from learning the progress of navigation from the start to the destination, which plays an important role in picturing the way to the destination in a mental model of the 3D map correctly.

To solve this problem, this manuscript proposes an indoor navigation system with a branch-type slider. A slider has two sides of a start and an end, and the user can move the knob between them. It is expected that the user learns the progress of navigation intuitively from the current position of the knob.

2 A Branch-Type Slider

A slider is a graphical control element with a knob that indicates the current value. The user can move it forward and backward to adjust the value. Sliders are often used to set the level of speaker volume, display brightness, image effects and other things. Figure 1 shows the look of a common slider to set image brightness and image contrast.

A slider is commonly a horizontal bar on which a knob runs. This manuscript proposes a branch-type slider. It is a horizontal bar that divides into multiple sub-bars. Figure 2 shows a branch-type slider that has a single start and four ends, and two forks between them. This manuscript demonstrates an in-campus navigation system using a branch-type slider. Users can choose which path to take at each fork to navigate them.

Figure 3 shows the design of a branch-type slider for our in-campus navigation system that works on a smartphone. This slider starts at the bottom to the

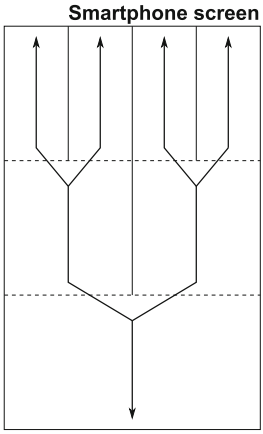

Fig. 3. Design of a branch-type slider for in-campus navigation.

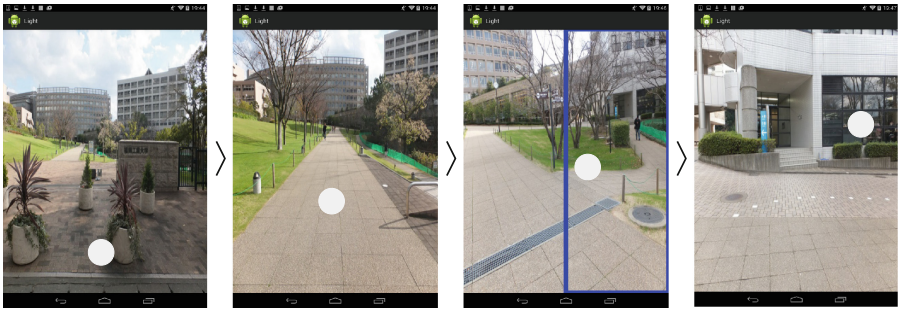

Fig. 4. Demonstrations.

four ends at the top. The screen is divided into seven regions that form the slider. When the user drags his/her fingertip across the dotted line between those regions, the corresponding fork will be selected and the navigation image will be displayed on the screen.

3 Demostrations

Figure 4 is a series of screenshots. The fingertip's position is represented by a gray dot on the screen. The user walks in the university's main gate (a) and takes the main path to the buildings (b), and goes to the right fork to the building C (c, d). When the user meets a fork of the path, a rectangle appears on the screen visually to support the user to choose which fork to take. The position of the rectangle switches between left and right depending on the fingertip's position.

Table 1. Result of the experiment.

Questions	Strongly bad	Bad	Neutral	Yes	Strongly yes
Did you feel your finger hinders you from seeing the screen?	1	1	2	1	1
Was it easy to manipulate?	1	4	1	0	0
Was it easy to take forks?	1	2	0	0	3

4 Experiment and Result

A brief experiment in usability of a branch-type slider for navigation was conducted. There were six subjects and they all were right-handed. Each subject was asked to use our in-campus navigation system for a period of time and answer some questions about usability with a scale with five levels of strongly bad to strongly yes.

Table 1 shows those questions and their responses. The responses from the first question vary in individuals. This is because the hand hides the screen when the subject is pointing at the top-left region of the screen and it does not when he/she is doing at the top-right region of the screen. The responses from the second question imply that the user interface has to be improved. This is because the branch-type slider is invisible to the subjects. Some visual cues like arrows, lines and borders might be helpful. The responses from the third question go into two groups. One says that the rectangle representing forks is helpful and the other says that the rectangle could mislead the user into perceiving it is a button. Overall, a branch-type slider has the potential for indoor navigation if the user interface is properly designed.

5 Conclusions

This manuscript proposed a branch-type slider for indoor navigation and built a proof-of-concept system, and conducted an experiment in usability. A branch-type slider is a horizontal bar that divides into multiple sub-bars. The result showed that the branch-type slider can be applied to indoor navigation if the user interface is carefully designed.

In the future work, we are going to discuss how a branch-type slider is integrated into the screen without any visual feedbacks.

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