HAPMAP: Haptic Walking Navigation System with Support by the Sense of Handrail

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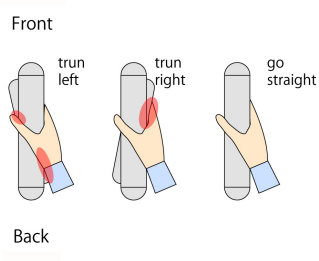

Figure 1. *The method of displaying sensation which sliding virtual curving handrail by hand.*

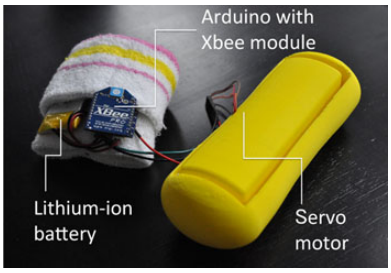

Figure 2. *Displayed 3D content from different points of view.*

Figure 3. *Experimental Route*

Introduction

In this study, we propose a method of displaying unaware-usage haptic sensation of navigation. People view a map when they visit an unfamiliar place, but when they are taken away their eyes from the map, their attention is diverted and margin of the heart. However, when we are relaxed and do not worry about getting lost, we can discover the intrinsic beauty of the unfamiliar land. Therefore, we have focused on the sense of touch and ensured security by using a support such as a wall or a handrail in the streets, along with the sense of touch. Therefore, we propose a haptic navigation system to release human eyes from the requirement of constantly looking into a map in order to enhance the experience of our daily walk or sightseeing.
We designed and implemented a prototype of a navigation system for walking with support by the support of a wall or a handrail, which contains a haptic display that can direct the use in any direction and control of the haptic display with an analog value. We also implemented the system, which allows to automatically directing the course we set. We confirmed its effectiveness with respect to navigation.

Mechanism

For the haptic display, the device should deliver a sensation of a sliding handrail and a sensation of a sliding curved handrail in order to inform the user of a change in direction. Hence, we have designed a haptic display resembling a seesaw in order to push the user's palm to reproduce the pressure distribution of a sliding handrail.
When the seesaw-like-display of the device does not turn, it informs the user to go straight. When the display tilts right, it informs the user to change direction to the right, and when it tilts left, it informs the user to change direction to the left.
In this sense, HAPMAP is able to present not only right and left-turn navigation cues, but also subtle navigation cues for navigating a winding road and/or path. Conventional navigation systems tell users to "Go Straight", even when the road or path curves in one direction or another.

Impremention

The prototype device developed in this study should be able to fit in a user's hand. In this study, we used a servo motor GWS/PICO, Arduino Fio, SFE-PRT-00341/860 mAh lithium-ion battery.
For the control of the haptic display, in order to operate the haptic display, we made a system by using infrared camera OptTrack.
It allows to recognizes and mesures the position of the user, so that the system is able to control the users by sense of walking along the curved railing which displayed in analog value.

Conclusions

In this study, we developed an unaware-usage haptic display in order to deliver to the user a sensation of walking with the support of a virtual wall or handrail. This haptic device suggests new possibilities for guiding users by delivering a sense of sliding along a virtual handrail with their hand and its curving rail for changing direction. In future, HAPMAP will be able to use conjunction with the general route search system in the smartphone and GPS.

References

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