Touch Depending on Dominant Eye in 3D Environments

Seong-Ho Yoon, Seung-Ryeol Kim, Jong-Man Kim and Seung-Woo Lee
Dept. of Information Display and Advanced Display Research Center, Kyung Hee University, Seoul, Korea
Tel.:82-2-961-0957, E-mail: seungwoolee@khu.ac.kr

This work deals with an interesting finding between human visual system and touch position of stereoscopic rendered objects. In our previous work [1], we reported that the touch position in 3D environment was significantly related to the human's dominant eye. In the report, we found that touch position is significantly affected by dominant eye when the 3D image has uncrossed disparity. In this paper, we report the relationship between 3D touch and dominant eye when 3D images are the crossed image.

In order to find out the relationship between ocular dominance and touch position, we perform a subjective test by using 3D display combined with IR touch panel. Fig. 1(a) shows the test pattern for our psychophysical test. As shown in Fig. 1(a), test pattern consists of two bars (2º x 0.25º) with gray level 128 on background level of 64. The two bars are left- and right-eye images. Designed depths from a viewer were 2.44, 2.7, 3, and 4 diopters (D). In our previous work, depths were 1, 1.25, 1.5, 1.75, and 2 D, which are the uncrossed 3D images. Fig. 1(b) shows distances of 3D images including screen position from viewers. Six Kyung Hee university students participated in the experiments. All had normal or corrected-to-normal visual acuity and binocular vision. Three students had the right dominant eye and the others had the left one. There were five depth conditions and we collected 20 responses for each condition. Thus, the total number of trials per person was 100. It took about 15 minutes for a subject to complete.

Fig. 1(c) and 1(d) show the results of the touch positions depending on the ocular dominance and depth conditions when uncrossed and crossed 3D images are displayed, respectively. In Fig. 1(c) and 1(d), the red and blue rectangles represent the average touch positions of subjects who have right and left dominant eye, respectively. The red, blue, and black dashed lines in Fig. 1(c) and 1(d) represent the positions of the left-eye, right-eye images, and the center of them, respectively. In the case of the uncrossed 3D image, as shown in Fig. 1(c), we can find that the subjects who have right or left dominant eye tend to touch the right- or left-eye images, respectively. In the case of the crossed 3D image, however, we can find that the touch positions of all subjects are mostly located at the center of the two images regardless of their dominant eye and depth of the 3D object as shown in Fig. 1(d). In conclusion, touch interface in 3D environments should be designed by considering human factors such as dominant eye or human recognition.

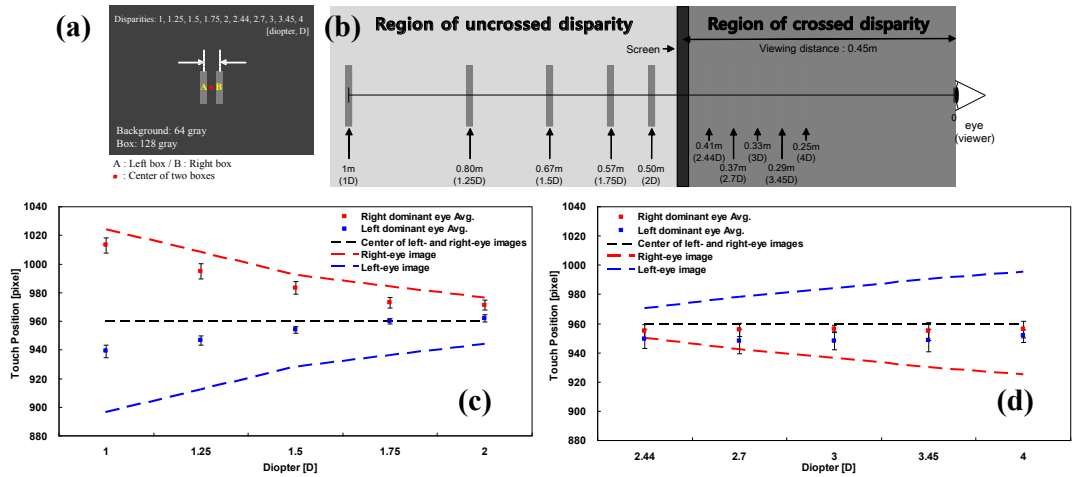

Fig. 1. (a) Test pattern, (b) the depth condition of 3D object in the experiment, (c) touch positions for uncrossed disparities and (d) touch positions for crossed disparities

Acknowledgment

This work was supported by the ICT R&D program of MSIP/IITP[10041416, The core technology development of light and space adaptable energy-saving I/O platform for future advertising service].

References

1. S.-R. Kim, J.-M. Kim and S.-W. Lee, "Touch Depending on Dominant Eye," International Meeting on Information Display, EXCO, Buk-gu, Daegu, South Korea, August 2014.