Forming Two Aerial Images on Both Sides of a Display Equipment

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1. Introduction

An aerial image that is popping over a display surface gives impact for viewers. One of the aerial imaging techniques is aerial imaging by retro-reflection (AIRR) [1]. The conventional AIRR forms an aerial image on a beam splitter. We have reported that use of a prism sheet increase luminance of an aerial image [2]. In this paper, we propose a method to form two aerial images over both sides of a display equipment.

2. Use of a prism sheet to change directivity

The highest luminance is obtained in the direction perpendicular to the display surface. A prism sheet, shown in Fig. 1, can change the directivity. Fig. 2 shows ray tracing simulation result. This result shows how the highest luminance rays refract. As Fig.2 shows, the prism sheet splits the highest luminance light for the two directions.

We have experimentally investigated change of the directivity. We have measured luminance distribution of a display on which the prism sheet installed. Fig. 3 shows luminance distribution of the display covered with the prism sheet. This graph shows there exist two highest luminance peaks. This result supports our ray tracing simulation.

3. Method to form aerial images on both sides

AIRR employs a half mirror and retro-reflection sheet. The light from the display is reflected on the half mirror. Then, the light incidents retro-reflection sheet. The retro-reflected light forms an aerial image.

In order to form aerial images on both sides, we have developed a proof-of-concept equipment shown in Fig. 4. We set a prism sheet on a display to split its light into two directions. Two half mirrors were placed perpendicular to the display. We set retro-reflection sheet as shown in Fig. 4. that is the reflected light incident location.

4. Results

Fig. 5 shows experimental results. Fig. 5 (a) is the aerial image observed form a left side of the experimental equipment. Fig. 5 (b) is the aerial image observed from a right side. The white frame is prism sheet location in Fig. 5. These results show that the white square where the prism sheet was attached was brighter than other area.

Thus, we have succeeded in forming aerial images on both sides of a display equipment and confirmed that use of a prism sheet increases luminance

References

[1] Yamamoto Hirotsugu, Yuka Tomiyama, and Shiro Suyama. "Floating aerial LED signage based on aerial imaging by retro-reflection (AIRR)," *Optics Express*, **22** (2014) 26919-26924.

[2] T. Kobori and H. Yamamoto, “Forming an Aerial Image Perpendicular to the Table Top,” *IMID 2015 Digest*, accepted (2015)

Fig. 1 Schematic figure of a prism sheet.

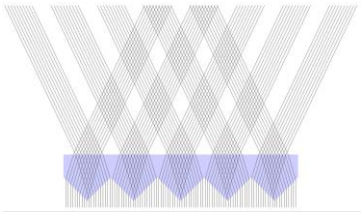


Fig. 2 Ray-tracing simulation for prism sheet.

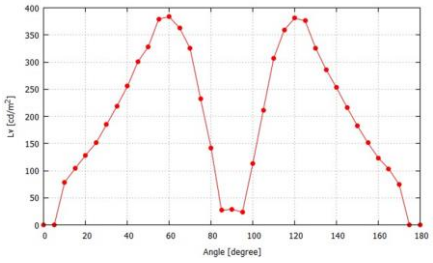


Fig. 3 Luminance distribution of a display covered with a prism sheet.

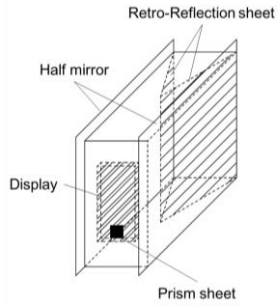
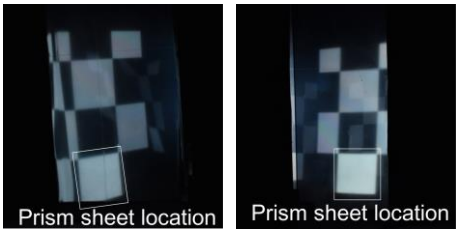


Fig. 4 Experimental equipment.



(a) Left side (b) Right side

Fig. 5 Increase of luminance of aerial image where the prism sheet was installed.