

X'talVisor : Full open type head-mounted projector

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1.Introduction

Today, most conventional wearable stereoscopic displays, such as liquid crystal shutter glass, HMD, and so on suffer the practical problem of covering a large part of the wearer's face, so that in daily use, they hinder normal communication with surrounding people. Some naked eye stereoscopic displays such as LCD with a lenticular lens array have been proposed, but they have limited viewpoints and narrow fields of view.

We propose a new type of head-mounted projector (HMP), named X'talVisor(fig.1) as an ideal tool for future VR collaborative environments. The X'talVisor is a head mounted type display with a large field of view, yet covers little of the wearer's face, so true "face to face" communication is not hindered by the display.

2.Full open type HMP

X'talVisor is a natural extension of retro-reflective projection technology (RPT) which used in HMP SIGGRAPH '99[1]. RPT consisted of a projector, half-mirror for reflecting projection images, and a retro-reflective screen for image projection(fig.2). RPT made it possible to project stereoscopic color images to a free-form surface screen with high contrast and brightness, but the large half-mirror covered most of the wearer's face.

In X'talVisor, the large half-mirror is replaced by an all-reflective spherical micro mirror. First, the pre-distorted image from the projector is concentrated by a condenser lens. The mirror is placed near the focal point of the lens so that the necessary mirror size becomes negligible. As we used a micro spherical mirror, the image is expanded and distorted. Since the projected image is already pre-distorted, the image projected to the retro-reflective screen is not distorted, while the field of view is large(fig.3).

As the mirror size is quite small, X'talVisor can display images without covering the wearer's face, and therefore enables natural open-face-to-face situations.

3.Future Work

X'talVisor is a device that allows "image experiences" to permeate deeply into our daily lives. Unlike conventional wearable displays, 3-dimensional scenography with heightened presence can be experienced with the same ease and comfort as wearing headphones for music. For example, by equipping X'talVisor with a headset, conversations

with remote persons are possible as if they were close at hand. Moreover, it is possible to perform training in mixed reality environments with the same unimpeded feeling as in the real world, without needing large-scale equipment such as flight simulators, CAVE, etc.



Fig.1 X'talVisor

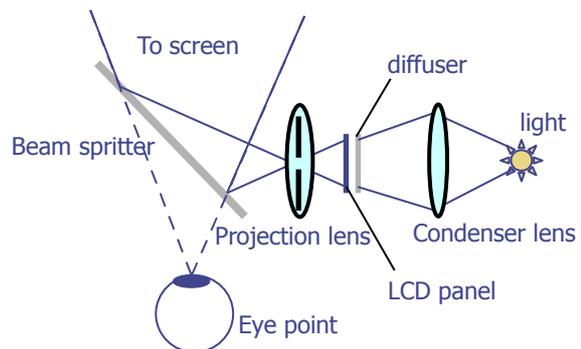


Fig.2 conventional RPT optical system

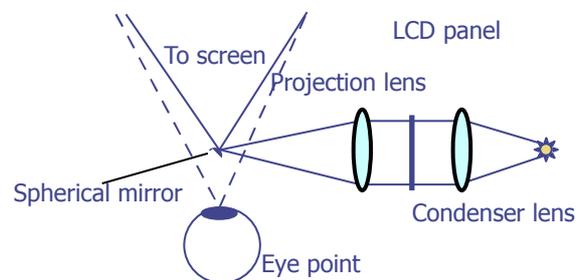


Fig.3 Improved RPT optical system

References

- [1]M. Inami, N. Kawakami, D. Sekiguchi, Y. Yanagida, T. Maeda, K. Mabuchi and S. Tachi, Head-Mounted Projector, ACM SIGGRAPH '99 Conference Abstracts and Applications, p.179(Emerging Technologies), 1999