Facilitating rearward visibility by controlling eye direction in HMD viewing of panoramic images

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I. Introduction

The development of HMDs for home use has progressed, and many people can now enjoy VR easily at home. Most VR services for 360-degree image viewing are used in a seated position. However, it is difficult for humans to look rearward in a seated position while rotating the neck and hips [1]. Although it is easy to look rearward when sitting in a swivel chair, it has been reported that the rotation of the seat surface amplifies the user's body movements and increases sensory discrepancy when viewing a 360-degree video with an HMD [2]. In this paper, we propose a new method that enables rearward visibility while sitting in a chair. The direction in which you are looking is called the eye direction. A rearward scenery that is different from the actual eye direction will be presented on the HMD to enable to look rearward without lifting the hips.

II. Eye Direction Exaggeration Method

The actual eye direction regardless of the scenery displayed on the HMD is called the "real eye direction" and the direction of the scenery displayed on the HMD by the program is called the "virtual eye direction". Although virtual eye direction is originally same as real eye direction, the angle of the real eye direction is exaggerated to display scenery on the HMD with a virtual eye direction different from it (fig.1). The graph is an example of the relationship between the real eye direction and the virtual eye direction. The virtual eye direction is the real eye direction the same as up to 45 degrees, and it is exaggerated from 45 degrees.

III. Experiment and Conclusion

We conducted an experiment to see if there were any problems with exaggeration. In the experiment, we prepared some different exaggeration patterns. Subjects were asked to try our new method using an HMD and fill out a questionnaire. In the questionnaire, we asked about "operability" and "discomfort". In addition, they answered about their impressions of the usefulness of our method. They all said that it was difficult to look rearward in normal condition, but exaggeration made it easier to look rearward. It was confirmed that this method facilitates rearward visibility and makes it easy to enjoy the scenery in all directions. As a future work, we would like to survey what kind of exaggeration patterns are appropriate, further suppress VR sickness and find a better way to exaggerate that is closer to the actual use of VR.

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References

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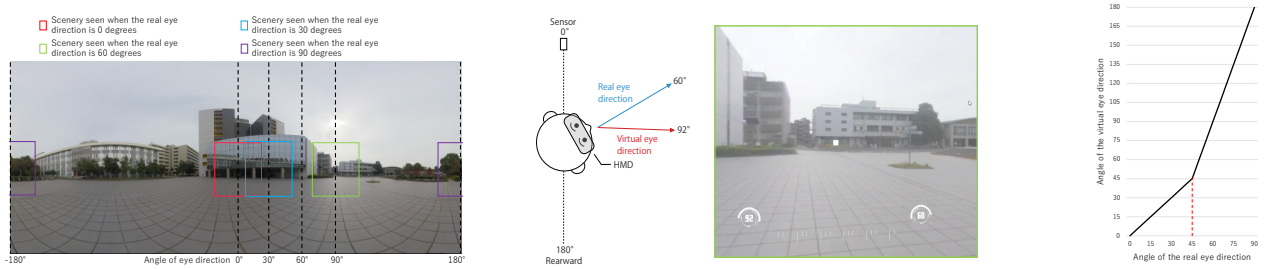

(a) Panoramic image **(b)** 60-degree angle in the real eye direction **(c)** Exaggerated pattern

Fig. 1: Example of our method