ARScope

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Figure 1: *Application Examples of ARScope.*

1 Introduction

ARScope is a novel visual interface for various applications of augmented reality. A user views the world through a handheld device that has a shape similar to that of a magnifying glass or a crystal ball. When the user holds the device over an object, the image of the occluded part is displayed on the surface of the device seamlessly as if the surface of the device were transparent glass. The displayed image can be edited freely by using some of the techniques that are used for augmented reality. For example, a red apple can be colored blue, or animated CG characters can be made to appear suddenly.

2 Features

In order to desplay the image of augmented reality applications, various techniques have been researched [Kato and Billinghurst 1999][Wagner et al. 2005]. The two typical devices used in these techniques are a head-mounted display and a handheld display such as a PDA. There are some difficulties associated with the use of these devices. One of them is the problem of tracking the user's viewpoint. In order to create an appropriate image for the user's arbitrary viewpoint, the application needs a head-tracking sensor or some markers. The other problem is the seamless connection between the displayed image and the real environment. Therefore, we propose ARScope, a device that aims at solving these problems.

Our proposed system has the following three features that have not been achieved by the conventional method.

Mobility: Users can look anywhere from an arbitrary viewpoint without the use of any head-tracking device or markers.

Seamless connection: The image displayed on the device and the real environment are connected seamlessly.

Multiple users: Two or more user's can use the same device at the same time since different pictures are presented in different directions.

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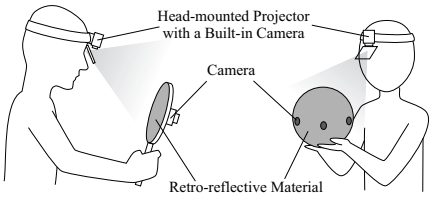

Figure 2: *System Configuration.*

3 Principle

ARScope employs a method for optical camouflage using a retro-reflective projection technology [Inami et al. 2003]. Figure 2 shows the system configuration. The proposed system comprises a handheld device and a head-mounted projector. The handheld device is covered with a retro-reflective material, and a superimposed image is projected onto it from the projector.

Both devices have built-in cameras. Cameras placed on the inner side or the reverse side of the handheld device capture the background image. Meanwhile, a camera built inside the projector captures the image of the user's view. By matching the feature points between these two images, a homography matrix between the two images is computed. Then, a projective transformation is applied to the background image in order to generate image that is suitable for the user's viewpoint. This technique enables the ARScope to display an image of the area occluded by the handheld device without the use of any head-tracking device or markers.

4 Conclusion

We have proposed and implemented the ARScope. In the future, we will improve the processing speed and the performance of this device.

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