

Integral 3D Display Using Multiple Projectors

With the aim of developing post-8K Super Hi-Vision (8K) broadcasting, we have been studying an integral three-dimensional television system that requires no special glasses for viewing. Integral 3D TV will enable viewers to watch a spatial image depending on a viewpoint.

The integral 3D TV system utilizes an array of aligned microlenses when the image is captured and displayed. The 3D imaging system captures “elemental images,” which consist of light rays emitted from an object in various directions that pass through the lens array. Because the three-dimensional image needs a display of elemental images composed from a large amount of optical data, this

system requires display devices with an extremely large number of pixels. The fact that there are no current display devices with pixels greater than 8K restricts the reproducible three-dimensional image quality when using a single display device.

We have built a prototype system that uses multiple projectors to increase the pixels of a display. This expands the “viewing zone,” which refers to the area in which a spatial image can be viewed. A broader viewing zone will enable more people to enjoy a 3D image simultaneously (Figure 1). Our prototype display system uses a direction-control lens (a Fresnel lens), which can adjust the projection directions of the projectors to



connect the individual viewing zones formed by the separate projectors into a broader viewing zone (Figure 2). There was a problem with 3D image distortion when the position of one elemental image projected in an oblique direction did not match the location of an individual lens in the lens array. To resolve this problem, we developed a technique to reproduce a distortion-free image through the use of computed image processing. The new prototype system utilizes four projectors, expanding the viewing zone of previous models by approximately 2.5 times in the horizontal direction and two times in the vertical direction (Figure 3).

Our future work has the goal of enhancing the quality of integral 3D images, and it will pursue elemental technologies for increasing the pixels through the use of multiple display devices.

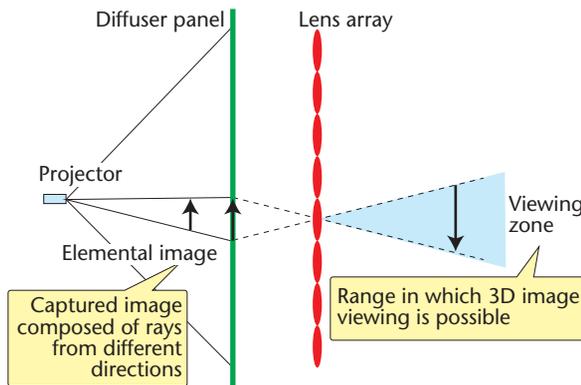


Figure 1: Integral 3D image displayed with single projector (conventional method)

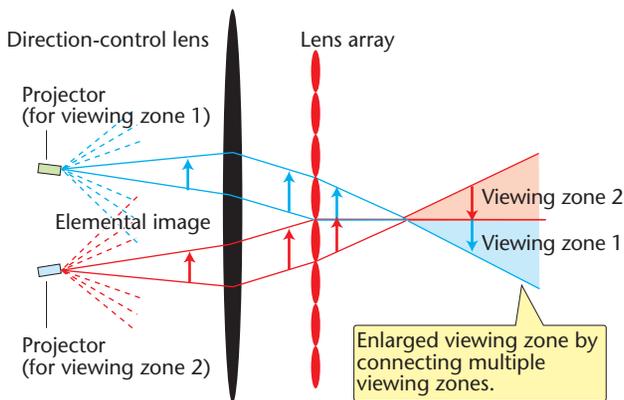


Figure 2: Viewing zone connecting using multiple projectors

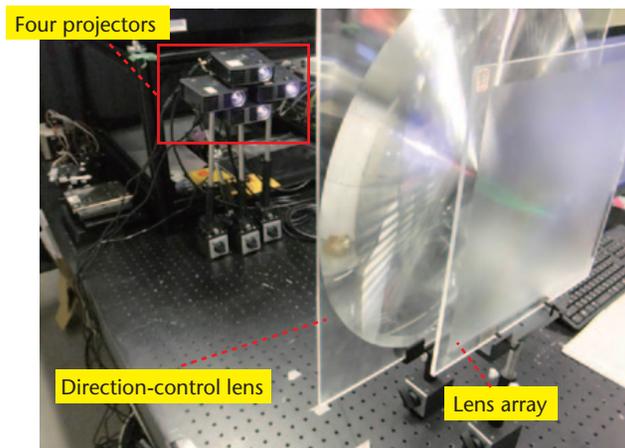


Figure 3: Prototype device