3D display combining multiview and volumetric technologies
Coarse Integral Volumetric Imaging
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Features

① **Floating 3D image**

Floating 3D image is shown in the air by generation of layered real image with lenses.

② **3D Image for multiple viewers with horizontal and vertical parallax**

Based on integral imaging technique, binocular and motion parallax both in horizontal and vertical directions are given, which makes it possible for multiple viewers to observe 3D image from their unique viewpoints at the same time.

③ **Reducing vergence-accommodation conflict**

Vergence-accommodation conflict is reduced with the help of volumetric technology

④ **Expression of occlusion and specular light**

Combining multiview technology enables expression of occlusion and specular light, which is impossible only with volumetric technology.
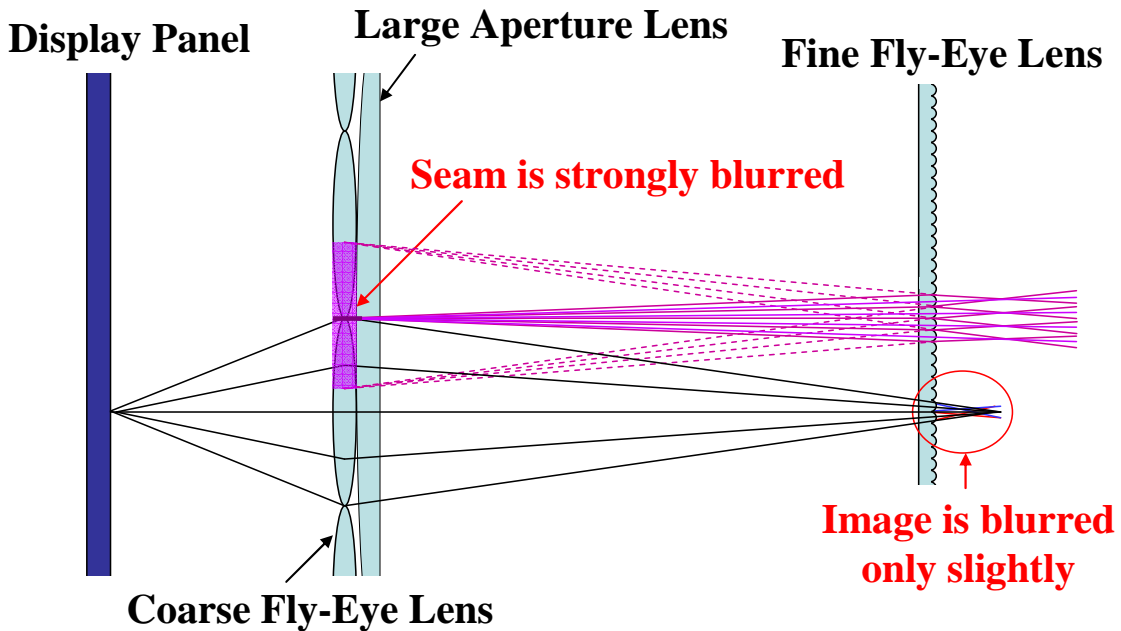
Technology

Traditional integral imaging uses a fine fly-eye lens whose elemental lens is perceived as one pixel. Coarse integral imaging uses a coarse fly-eye lens so that multiple pixels are observed through each elemental lens, which generates real image or virtual image of the display panel. When multiple display panels are layered, layered real image or virtual image is formed, which enables integral imaging with volumetric features. To show high quality image, optical distortions and aberrations of the generated image are compensated on the software basis, which is one of the key technologies in this method.
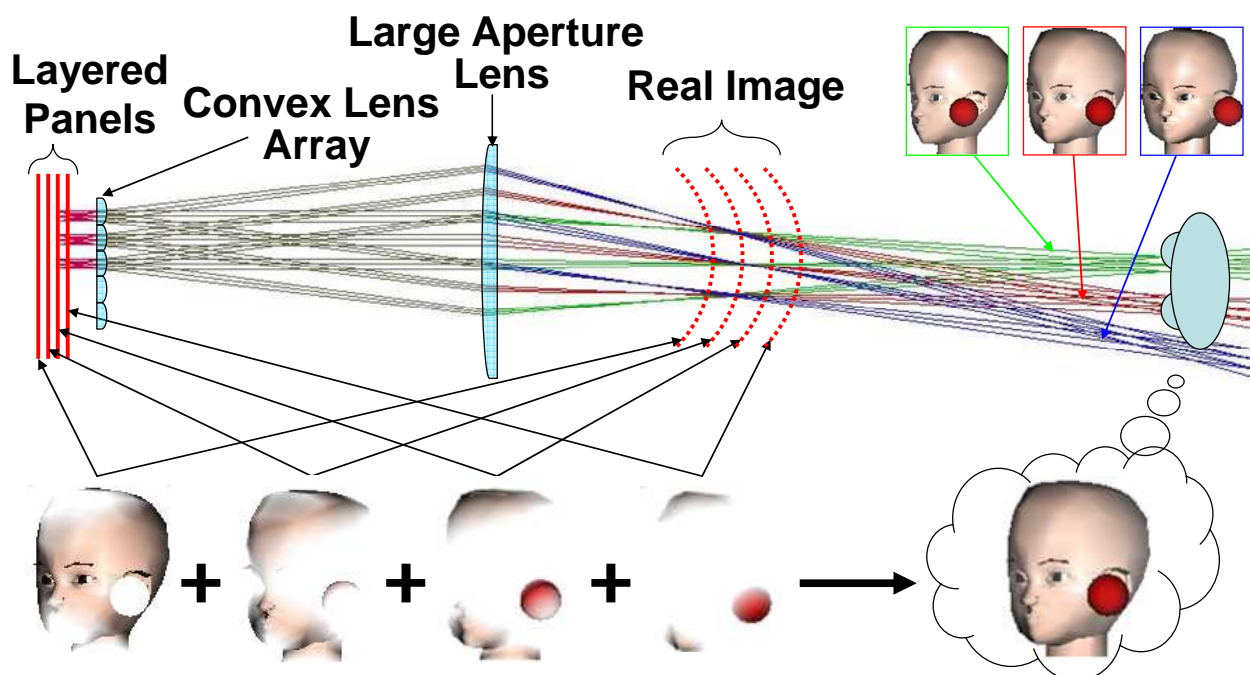
Recent Improvement 1

·Smoothing lens seam and moiré

By inserting a fine fly-eye lens with long focal distance near the real image, seam of coarse lens array and moiré pattern caused by layered panels become indistinct.

Display Panel **Large Aperture Lens** **Fine Fly-Eye Lens**

Seam is strongly blurred

Image is blurred
only slightly

Coarse Fly-Eye Lens

Recent Improvement 2

·Higher resolution

Conventional integral imaging suffers from the trade-off between resolution and number of views. By using elemental lenses whose optical axis is not in the geometrical center of lenses, 3D image with higher resolution and stable depth can be presented.

Optical center of lens ①
Optical center of lens ②
Optical center of lens ③
Optical center of lens ④
Optical center of lens ⑤

F

①
②
③
④
⑤

Center of image

Centers of elemental images

f

Elemental lenses (focal distance: f)

Large aperture lens (Focal distance F)