

Japanese Public Broadcasting Envisions 3D Future

Japan's national public broadcasting authority, Nippon Hoso Kyokai (NHK), is pursuing a Super Hi-Vision 3D television. NHK's research has centered on the integral imaging (II) technique for creating 3D television. This avenue of research was chosen because the 3D image can be viewed without the use of special glasses. In addition, because an actual three-dimensional image is replicated, eyestrain caused by viewing "ghost" images is avoided.

NHK researchers have refined their model heavily over the last 15 years. Currently, the key component is a lens array composed of tens of thousands of tiny lenses, or "lenslets" arranged in a regular pattern. Each lenslet's angle reveals a slightly different perspective on the scene to be recorded. An incredibly sensitive CMOS image sensor—over 16 times the sensitivity required for HDTV recording—records the reflected light rays. Then, the captured images are analyzed to create the original 3D image. To create live 3D HDTV feeds, NHK's HDTV version of a 3-D camera records and analyzes data composed of over 410,000 pixels at a frame rate of 59.94Hz.

To display the image, the recording process is reversed. An incredibly sharp LCD screen projects through a lenslet array to create a holographic image. Of course, using a lens reverses the image (much like looking through the bottom of a glass), so during the display process, a concave-convex converter is used. In order to convey scenery depth, NHK researchers devised an algorithm calculating the parallax of each lenslet's reflected light, creating a hologram that is different in both size and position from the original object.

Because current technology cannot create small enough pixels, much like older television sets, the display choices are either a big, fuzzy hologram, or a small, sharp hologram. Since the size and pixel pitch of the HD LCD restrict the viewing zone, current technology limits the size of the viewing zone to about 2.5" at 35" away. In addition, the coarseness of current LCD screens generates a "ghost" reverse image, which NHK is eliminating through computer processing of the recorded data. To increase hologram size, NHK is working with "extra" LCD light bent around the lenslets to fill in the "gaps" left between pixels.

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