



Emerging market

Scrap those 3D specs

Screens that show you 3D images wherever you sit could revolutionise TV

Jeff Hecht and Vijaysree Venkatraman

GET ready to throw away your 3D glasses. There is a way to make images seem to stand out from a flat TV no matter where you are in the room – without the need for any silly eyewear.

Depth perception depends on differences between what our two eyes see. 3D movies simulate that effect by projecting the two views simultaneously onto the same screen. With “active shutter” 3D systems, viewers wear special

“The higher resolution allows us to rebuild the image and project it onto the eye of the viewer”

glasses that alternately block one view from each eye at high speeds.

This trick can work without glasses – as long as the screen includes “parallax barriers”, which deliver a different view to each eye. Nintendo’s 3DS handheld games console, for

example, uses this technology. But viewers must be in a specific spot for it to work – fine for an individual holding a small screen, but no good for groups.

Ramesh Raskar and colleagues at the Massachusetts Institute of Technology Media Lab have developed displays that can create a wide field of view by splitting a 3D image into 2D slices, much like a brain scan. An algorithm works out which slices need to be seen from each viewing angle to allow everyone in a room to see a 3D image (see diagram, right).

Light is sent through an array of small lenses – which refract it over a viewing angle about 50 degrees wide and 20 degrees high – and through an LCD screen that carries part of the final image. The light then passes through two additional LCD screens. These screens contain elements of the final image. Their pixels switch between transparent or opaque at 120 frames per second, producing patterns that channel the correct

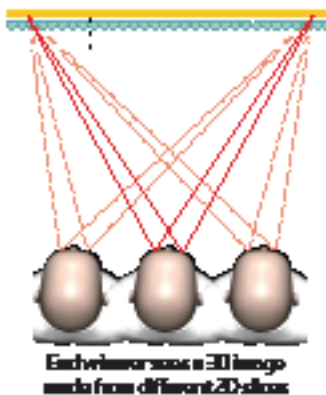
2D image slices to your eyes.

Move your head to one side and two new slices of the original image come into view. Each eye sees a different 2D view of the image and the brain combines them to form a clearer 3D image.

“It shows you strange-looking frames at very high rates,” says

Stereo vision

Patterns created by pixels in the screen either block or allow light through to guide a different 2D image to each eye.



team member Gordon Wetzstein. The individual frames flicker as the pixels switch on or off, but it happens so fast that the brain simply blends the sequence of frames together.

“The display deliberately exploits limits of the human visual system,” says Wetzstein, who will demonstrate the system at the SIGGRAPH conference in Los Angeles in August.

“It is a great project, and a lovely piece of science, but I really can’t see it being the 3D TV of the future,” says Nick Holliman of the Visualisation Laboratory at Durham University, UK. The algorithm running the patterns will be too computationally intensive to be practical, he says.

Future displays could go much further towards personalising what is displayed. Researchers from Brazil’s Institute of Informatics at the Federal University of Rio Grande do Sul (UFRGS), Purdue University in West Lafayette, Indiana, and MIT have designed a screen that can compensate for bad eyesight.

“It creates hologram-style imagery that adjusts itself to the subject’s eye conditions,” says Vitor Pamplona of UFRGS, who designed the prototype and will also present his idea at SIGGRAPH.

Pamplona’s prototype uses a small, high-resolution parallax barrier created by having two LCD screens on top of one another. “The higher resolution allows us to rebuild the image, pixel by pixel, and project it directly onto the eye of the viewer,” he says.

The user types in their eye prescription and the system adjusts the apparent 3D depth of each pixel to bring it into focus. The algorithm can even take into account more serious eye problems, such as cataracts, by splitting the image into segments and placing the segments at focal depths that avoid the damaged part of the eye. But because it uses a standard parallax barrier, the system can only cater for one person at a time. ■