

## The next dimension of digital

by Jonathan Sidener

The holographic video showed a tiny, 3-D man jogging in place inside a glass cube.

**NEXT DIMENSION DIGITAL** - The Grimage system lets a user stick a hand into an empty cube and have it appear in an on-screen 3-D world. The system takes information from multiple cameras and creates a digital 3-D version of the hand. In the demonstration at the recent SIGGRAPH conference in San Diego, people could interact with an on-screen jack-in-the-box, shaking, poking and prodding it. CNS Photo courtesy of SIGGRAPH. **A VIRTUAL STROLL** - String Walker facilitates walking through a virtual world while staying in one place in the real world. The system uses eight strings attached to the walker's shoes. The turntable records changes in the length of the strings and rotates to allow steps to the left or right. CNS Photo courtesy of SIGGRAPH. **TOUCH OF THE FUTURE** - Haptic Teleexistence simulates the sense of touch between the glove and a robotic or a virtual hand. This lets a user perceive the shape of an object. In the future, it could lead to remote handshakes complete with the sense of skin temperature and the firmness of a grip. CNS Photo courtesy of SIGGRAPH. The little black-and-white jogger - reminiscent of Princess Leia, the "Star Wars" character who appeared as a small hologram beamed into a room by the droid R2-D2 - can be viewed from the front, side or back.

Attendees in San Diego at the recent SIGGRAPH conference for digital artists and animators walked around the cube to view the moving figure from every angle, some with mouths slightly open, as if in disbelief. Others smiled appreciatively.

It doesn't take a futurist to imagine that this could be the next generation of television, or an early stage of something that replaces TV. The jogger, which was demonstrated earlier in August, is fascinating. What if you could control him like a video game character? And what if you had two controllable avatars who could box or sword fight? And what if you recorded actors performing Romeo and Juliet?

SIGGRAPH, more formally known as the Association for Computing Machinery's Special Interest Group on Graphics and Interactive Techniques, is something of a window into the future of digital media. It was at a SIGGRAPH conference, years ago, that virtual reality was first demonstrated in public.

In 1982, the conference saw the first demonstration of the morphing of digital images. In later years, graphics researchers demonstrated the physics and math it took to make computer pixels simulate cloth fabric, to make light reflect and to make smoke rise fluidly from a fire.

Whether this holographic video materializes as a consumer device in the next 10 or 20 years remains to be seen. But a look around SIGGRAPH's emerging technology exhibit, where hologram man jogged, showed that traditional two-dimensional TV will face plenty of competition in coming years.

At a nearby exhibit, people put their hands into an empty box and had them appear on a computer screen where they could poke and prod a 3-D jack-in-the-box. At another exhibit, people put on a cyborg glove to feel the weight and resistance of objects in a 3-D world. Others watched a 3-D video on a flat-panel television without wearing special glasses.

For any of these cutting-edge technologies, the cost of hardware and software is an obstacle to making the transition from lab curiosity to consumer product. The creators of the holographic video - the University of Southern California's Institute for Creative Technologies, Fakespace Labs and Sony - say that at the rate hardware prices are falling, the technology could be available for home use in 10 years.

Technically known as an "interactive 360-degree light field display," the holographic video is rendered by modified off-the-shelf hardware.

Overhead, a modified version of a digital projector fires 5,000 frames per second onto a rapidly spinning mirror.

In traditional 3-D video, the illusion of three dimensions is created by sending slightly different images to each eye, recreating the slightly different perspective eyes have in the real world.

The holographic video is a series of these 3-D videos, recorded and reproduced from 288 viewing angles, like 288 slices of a pie. The projector is sending out 288 3-D videos, one for each slice of the pie, on each rotation of the mirror.

When viewers move from side to side, they see a different slice of the pie. Just as the brain perceives the series of frames of a movie as a single moving image, it perceives changes in viewing angle as horizontal motion.

In viewers' minds, they see a jogger from multiple angles.

In reality, they are switching among 288 simultaneous videos.

This first demonstration of the holographic video is in black and white with a small 3-D figure. Researcher say the technology can be upgraded fairly easily to include color and larger figures.

Not far from the little jogger are two flat-screen, 3-D TV monitors. One, from Texas Instruments, requires special battery-powered glasses and is expected to be offered to consumers soon.

The company says 3-D capability can easily be added to its DLP HDTVs; it expects to sell 1 million 3-D ready televisions by the end of next year.

The other TV, which produces its 3-D illusions for the naked eye, is available to businesses with a need and a budget for a \$70,000 monitor.

It's not so much a question of whether the future will be 3-D and holographic, a SIGGRAPH spokesman said. It's a question of whether we will view the holograms on the wall, where we can view them from many angles, or in the middle of the room where we can gawk from any angle.

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