Slashdot Article: http://science.slashdot.org/article.pl?sid=07/09/23/2339207

Drawing on Air With Haptics in 3D

Posted by Zonk on Sun Sep 23, 2007 08:06 PM
from the **just-like-in-longest-journey** dept.

Roland Piquepaille writes

"In a recent article, PhysOrg.com reports that a team of computer scientists at Brown University has developed 'Drawing on Air', a haptic-aided interface to help artists to create 3D illustrations while wearing a virtual reality mask. 'The technique introduces two new strategies, using one hand or two hands, to give artists the tools they need for drawing different types of curves, and for viewing and editing their work.' The researchers hope that these techniques will improve the precision with which scientists can interact with their 3D data using a computer. This also would help artists to illustrate complicated artistic, scientific, and medical subjects."
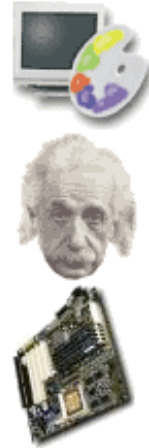
▶ graphics, technology, science *(tagging beta)*

Piquepaille's Full Article: http://www.primidi.com/2007/09/23.html

Drawing on Air

In a recent article, *PhysOrg.com* reports that a team of computer scientists at Brown University has developed Drawing on Air, a haptic-aided interface to help artists to create 3D illustrations while wearing a virtual reality mask. 'The technique introduces two new strategies, using one hand or two hands, to give artists the tools they need for drawing different types of curves, and for viewing and editing their work.' The researchers hope that these techniques will improve the precision with which scientists can interact with their 3D data using a computer. This also would help artists to illustrate complicated artistic, scientific, and medical subjects. Read more for several pictures made with this system.
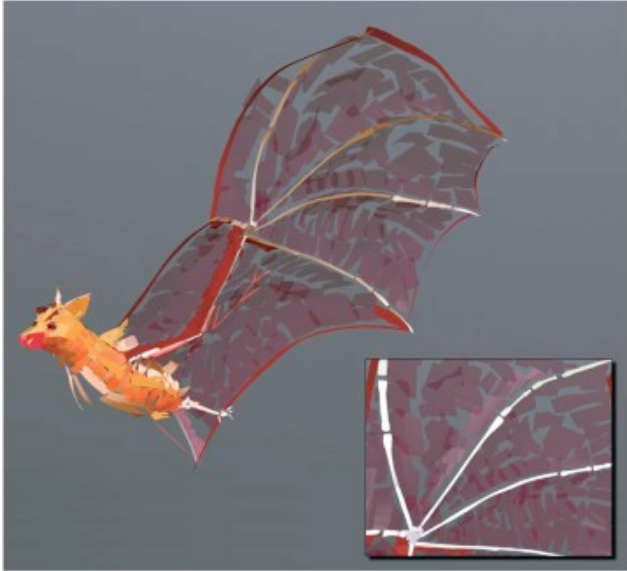
You can see above "one view of a 3D line illustration of a bat in flight created with Drawing on Air. Three-dimensional input techniques inspired by tape drawing enable artists to create smooth controlled 3D lines, as we see in the wing bones, with far more precision than is possible with freehand 3D drawing. The inset picture is a zoomed-in view of the wing from a different angle, showing artistic use of line weight to highlight joint locations." (Credit: Brown University)

One of the researchers, Daniel Keeke, who is also an artist, did a series of works based on artistic anatomy in collaboration with a professor of illustration who teaches anatomical drawing. Each work was critiqued in VR from an artistic standpoint, and the direction for the next work was decided upon based on the critique and the goal of exploring the possibilities of the medium for representing complex natural forms." Two of these results are shown here: a bearded man (above) and a Swahili bride (below). If the bearded man is quite sculpted, the Swahili bride is created with minimal use of line. (Credit: Brown University)

But how the images above have been produced? "Drawing on Air uses a stereoscopic desktop display. A Phantom haptic device and 6-Degree-Of-Freedom (DOF) trackers are used for a two-handed input." (Credit: Brown University)

This project has been led by Daniel Keefe, a postdoc in computer science, Robert Zeleznik, a research director, and David Laidlaw, an associate professor of computer science. The three rsearchers are working at the Visualization Research Lab (VRL) which is headed by David Laidlaw.

Now, let's look at the *PhysOrg.com* article for some short quotes, starting by one about the two-handed method. It is "based on the 'tape drawing' technique, which is a highly controlled, two-handed method for drawing in 2D. Artists hold a stylus in one hand for drawing and a tracker (hooked up to the virtual reality setup) in the other hand for defining the direction of the line. The artist coordinates the movement of both hands to examine the work from different angles and draw accordingly."

Apparently, if this method provides lots of control, it is difficult to learn and will be used by experts. This is why the researchers also developed a one-handed method. It "is easier to learn, and is also more appropriate for drawing circular shapes because the artist's arms

don't need to cross. In the one-hand method, the artist defines the direction of the line and draws the line with the same hand. The researchers describe the drawing operation as a pen being dragged behind the artist's stylus as if on a tow rope. This drag enables the user to establish a drawing direction before actually drawing."

PhysOrg.com adds that "in both versions, artists can stylize their curves while drawing by dynamically adjusting line thickness and color. Haptic effects enable artists to intuitively adjust line thickness by applying pressure against an imaginary 3D surface, making drawing in the air feel similar to pushing a paintbrush against paper. Artists can easily switch back and forth between the two variations, and can also edit their work with the system's features."

For more information, this research work has recently been published in the *IEEE Transactions on Visualization and Computer Graphics* under the name "Drawing on Air: Input Techniques for Controlled 3D Line Illustration" (Volume 13, Number 5, Pages 1067-1081, September/October 2007). Here are two links to the abstract and to the full paper (PDF format, 14 pages, 9.89 MB), from which the above pictures have been extracted.

Sources: Lisa Zyga, PhysOrg.com, September 19, 2007; and various websites