Advanced Graphics Technology

This is our annual meander through the best of the Siggraph Emerging Technology venue. Siggraph 2011 (www.siggraph.org/s2011) featured examples of cool advances in computer graphics. As with any evolving field, incremental improvements dominated the display floor. To Siggraph’s credit, Emerging Technologies has been a consistent venue since the early 1990s. The venue is valuable both to attendees, who get to see samples of reviewed new technology, and exhibitors, who get reactions from show attendees and a much better understanding of setting up and staffing a booth.

Two Approaches to 3D Displays
Disney Research has another entry in the search for a full 3D display. A.C. Traub published the concept of a volumetric display using a rapidly rotating mirror in 1967. The Disney device uses a full-color LCD as the primary image source. An actively addressed LED backlight is synchronized to a vibrating beam-splitter and strobed to project the position of image planes in a volume. A fixed concave mirror in the optical path makes the images seem real and appear in front of the apparatus. The illusion is effective and suffers less from flicker than many of its predecessors.

A second approach that uses intersecting lasers first occurred in a device 3D Technology Labs (3DTL) developed in the mid-1990s. This approach intersected lasers in a specially treated glass cube. Battelle Research Labs initially developed intersecting lasers in the early 1970s. Burton Inc. and Keio University intersected lasers in air quickly enough to create a hovering image in 2006. The Japanese team’s latest effort appeared at Siggraph as the True 3D Display. This version is a significant advance in both visual and audio quality. The images are clearer. And the sound of lasers intersecting in air that evoked analogies to a bug zapper are gone.

Mirror, Mirror
Current techniques for physiological monitoring typically require users to strap on bulky sensors, chest straps, or sticky electrodes. The Medical Mirror (http://web.mit.edu/newsoffice/2010/pulse-camera-1004.html), a joint Harvard-MIT project, promises to transform medicine by producing exquisitely detailed individual physiological data. The Mirror is a logical extension to Georgia Tech’s medicine cabinet, which automatically determined when prescription refills were needed. The new mirror interface for real-time, contact-free measurements of heart rate can eliminate the need for external sensors. Users can experience remote health monitoring by simply looking into the Mirror.

Touchless Manipulation
MIT Media’s Recompose system (www.fastcodesign.com/1663229/mts-recompose-is-a-touch-screen-keyboard-and-3-d-display-video) uses a camera to detect hand motion to functionally manipulate an actuated surface. Recompose uses the body as a tool for direct manipulation along with gestural input. The system actually lets a person use freehand and touch gestures to manipulate the 3D geometry of the pin array that controls the actuated surface. Recompose uses the body as a tool for direct manipulation along with gestural input.

Deforming Soft Objects with Touch
Researchers from Teamlab, Keio University, and the University of Tokyo demonstrated the FuwaFuwa sensor (www.designinterface.jp/en/projects/FuwaFuwa). FuwaFuwa is a small, flexible, wireless module that measures shape deformation in soft objects by measuring infrared directional photoreflectivity. Users can convert any soft object into a tangible device by embedding multiple FuwaFuwa sensors, without affecting the object’s softness. Doing so allows the new tangible device to detect both touch position and surface displacement.

Sculpting with Volumetric Pixels
Unlike light-emitting displays such as LCDs, color-forming displays such as E-Ink reflect surrounding light. Photochromic sculpture (http://nae-lab.org/~hashida/pSculpture.html), a project from the University of Tokyo and Keio University, uses this type of material in three dimensions. Such displays are easy on the eye and work even in bright, sunlit places. At Siggraph, photochromic sculpture demonstrated the concept, which depends on contactless color control in a volume, and allowed attendees to dynamically change a 3D sculpture.

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