



Related
Articles



Feature Article

Commercial Virtual Reality Applications Enter Military

Gains mean that computer graphics not just for flight simulation anymore

by Kristy Ann Pike

After two decades as the driving force behind visual simulation, the armed forces are following a trail blazed mostly by civilian companies: virtual reality. 

Recent developments in virtual reality technology, long associated with design firms, research labs and entertainment companies, have set the stage for new military applications. As powerful, easy-to-use hardware and software have become available, military groups are finding virtual reality to be an efficient design and instruction alternative.

In 1968, the first attempts to use computers as simulators began, to duplicate real objects in situations where the cost of constructing a physical model was too great. Early entries in the visual simulation market were primitive, exotic, and expensive, but by 1973, the technology had matured to the point that an organization could save \$20 million per year using a simulator for flight training.

Commercial airlines and the military propelled the computer graphics industry throughout the 1970s and much of the 1980s. In particular, the armed forces' need for better and faster simulators constantly pushed the boundaries of visual simulation technology. Government contracts financed the development of what has become "immersive visual simulation" - a combination of computer muscle and engineering magic better known today as virtual reality.

Simulators have thrived because they provide a means of "virtually" trying things that are too expensive, too difficult, or too dangerous to do in the real world. In the early days, that meant vehicle training, particularly flight training. But as computer performance has steadily improved, and the costs associated with the technology have decreased, virtual reality has become a viable option for many different applications.

Civilian customers were among the first to adopt virtual reality for purposes

more mainstream than flight training, and they have typically required that the hardware and software running the applications be mainstream as well. Now, using new, commercially available hardware and software, military applications are popping up that challenge the notion that virtual reality is an expensive proposition best reserved for flight simulators.

Growing Industry

"Visual simulation is an exciting, rapidly growing industry," said Tom Coull, president of Mill Valley, California-based Sense8 Corporation that supplies WorldToolKit and World Up virtual reality and visual simulation software as well as custom applications and integration services. The demand for such products is growing--Sense8 has doubled its annual business every year since its founding in 1990. Other companies also report an increasing demand for commercial virtual reality products.

"Our customers are embedding visual simulation features into their own diverse applications," Coull explained. "That we are seeing this kind of integration signals virtual reality's transition from computer lab to mainstream tool. The fact that Sense8 has made advanced virtual reality features easy to use and available on cost effective platforms has certainly boosted our share of this growing market."

Bertrand de La Chapelle, associate director of Senil, France-based Virtools, agrees that complete solutions are important. Virtools, a leading developer and integrator of professional virtual reality applications, designed a system for Airbus Industrie of Blagnac, France, which allows participants to "walk through" a prospective airport departure lounge and embark onto a future generation of Airbus aircraft. The virtual interior allows designers to convey their vision of what the next generation of Airbus planes will look like.

"Our clients are not concerned about technology," said de La Chapelle. "What they want is the best possible way to assess their designs, to discuss their models, and to work with the most efficient tools."

Early Test Drives

One Fortune 500 company that was quick to adopt virtual reality was Caterpillar Inc. Together with the National Center for Supercomputing Applications at the University of Illinois, Caterpillar has developed a virtual environment for testing new machine designs before they are built.

Using a sophisticated virtual environment, operators "test drive" new Caterpillar equipment. The system displays images that respond to the operator's movements, allowing Caterpillar to assess the operator's view from the cab, test the ease of manipulating the vehicle, and evaluate other critical qualities of the design related to operation.

According to Caterpillar, the system reduces the time between design and test stages and ensures a quality design when the company does not commit to a

stages and ensures a quality design when the company does not commit to a physical model. Early, unproven designs can be reviewed safely by operators with a visual simulation. "The entire process is much more interactive," said Ken Ahlers, manager of university relations for Caterpillar. "We can test more designs in less time, and easily make and test multiple modifications to a single design."

Caterpillar's system is a sophisticated one that includes a custom application developed by the company, but according to Coull, not all virtual reality systems are as complex as Caterpillar's. "Our customers work in every imaginable hardware environment from Window-based PCs to SGI Reality Engines. Some customers even use multiple platforms at the same time, or migrate their applications from one platform to another"

The key components to a successful virtual reality application, Coull says, include powerful, easy to use software; a complete set of visual simulation features including texture mapping, availability on and mobility between standard hardware platforms; and cost efficiency.

Defense Applications

Companies working with clients in the defense industry have found that those same features are applicable in military contracts. One Sense8 customer team--Vitronics Inc., Eatontown, New Jersey, and the Army Research Laboratory (ARL), Fort Monmouth, New Jersey--has created an application for the U.S. Army that uses virtual reality to analyze flat-bed displays. As new screen displays are created for various projects, ARL's application allows the Army to test the design and management of the displays.

"Our application is PC-based, but the Army is very scalable," said Steve Velenger, senior applications engineer at Vitronics. "They may be on PCs in the field, but we often see workstations at a command post. Being able to have our software move easily from platform to platform is crucial. Good networking features are also important."

Before they began to use visual simulation, ARL/Vitronics would create static, two-dimensional images to analyze display capabilities for the Army. that was fine for some display applications, but it didn't allow users to interact with the design. Now, with virtual reality and improved computer capabilities, users can point and click and the images on the screen respond accordingly. This interaction gives users the impression that they are a part of the application, and provides ARL with a clearer indication of whether or not the displays provide sufficient information in an intuitive format.

The National Guard also uses virtual reality in a non-traditional application. The New York Times reported in December, 1994, that a plan had been approved that calls for the National Guard to take on peacetime jobs now performed by active duty forces. "We want to get more bang for our buck," said Deborah R. Lee, assistant secretary of defense for reserve affairs.

Guardsmen and reservists typically spend comparatively little time--one weekend a month and two weeks a year--performing their duties. If the new plan is to succeed, the Pentagon must utilize that time efficiently, making training more important than ever, said officials. Using virtual reality, guardsmen and reservists can now keep updated on the expensive technology they are expected to understand, operate and repair. Under contract to the Pentagon's Advanced Research Projects Agency (ARPA), the Research Triangle Institute (RTI) of Research Triangle Park, North Carolina, designed and implemented an advanced training system for National Guard tank mechanics.

The system includes a full set of courseware, and uses WorldToolKit virtual reality software to launch visual simulation scenarios from within the training lessons. The training system is geared to maintain a mechanic's proficiency in the use of technical manuals and simplified test equipment in diagnosing problems.

Designed specifically for the M1 Abrams tank and M2 Bradley fighting vehicle, the training system provides mechanics with valuable interactive training time on a monthly basis. Since large and expensive tanks are not typically available at local armories, guardsmen previously had to travel to a major base to get hands-on time with the vehicles. That travel typically happened only once a year.

Now, using a virtual reality system, mechanics can navigate through three-dimensional computer models of the vehicles as well as detailed views of their interiors showing the line-replaceable units (LRUs). They can also interact with the interior of the gunner's and driver's compartments, and select any of the LRUs in either compartment for closer inspection. They can then activate switches, rotate knobs, and manipulate controls while performing diagnostic tests. The training module guides and monitors the students' progress in diagnosing a fault in the vehicle.

Easily deployable to local armories, this frequent interactive training reduces review time when guardsmen fill their annual two-week duty, and helps ensure that they are prepared in the event that they are called for active duty. "We selected WorldToolKit as our virtual reality development tool because it provides a full range of advanced features and is available on the PC platform," said Jorge Montoya, manager of RTI's virtual reality laboratory.

The future for useful applications of virtual reality seems as limitless as the computer industry's ability to increase application speed and improve graphics quality. As civilian and military users continue to take advantage of the high-quality hardware and software available commercially, new applications in training, design, analysis and user interfaces will emerge.

"Virtual reality is the ultimate human-human interface," said Virtools' de La Chapelle. "It provides a new level of discussion; a means of sharing a vision."

Kristv Ann Pike is the owner of Pike & Associates Communications. a St.

*George, Utah-based marketing and public relations company specializing
in high-tech companies and products.*