Games get serious: video games can power molecular research

by Jonathan Sidener

Klaus Schulten, an Illinois molecular researcher, and his team generate computer simulations of working human cell components in a process that starts with an expensive supercomputer. The computer crunches data for millions of atoms.

When it's time to view the molecules interacting, the researchers turn to PCs with relatively inexpensive video cards - the same Nvidia and ATI cards that serious game players buy online or at electronic stores.

"It's been a godsend, a gift to science, to use this," said Schulten, director of the Theoretical and Computational Biophysics Group at the University of Illinois' Beckman Institute.

"When we started out 15 years ago, we had a $400,000 graphics computer. It couldn't do the things that these graphics boards do that cost a few hundred dollars. Today everyone has one on their desk."

As companies such as Sony, Microsoft, Nvidia and ATI pump millions into research and development for the competitive video game industry, technology is beginning to spill over into non-entertainment applications like the Illinois molecular research.

The socially redeeming benefits go beyond hardware. Software developed to create recreational 3-D worlds is being used in education and health care. It is also promoting various political and religious beliefs in what's being called the serious-games movement.

The Cell processor, developed by IBM for Sony's PlayStation 3 video game system, is the most prominent example of the potential for game technology. Recently, the U.S. Department of Energy said IBM will develop a supercomputer using Cell processors capable of more than 1,000 trillion calculations per second, or one petaflop.

Sony is working with Stanford University on a project to use idle PS3s for scientific research. During downtime, online gaming machines in living rooms around the world could contribute their Cell processing power to the Folding@Home project. This project studies how proteins are formed and their role in a number of human diseases.

The "distributed computing" project uses donated processing time from more than 1 million desktop computers.

Mercury Computer of Massachusetts has a deal with IBM to spin off medical, military and other applications using the Cell processor. The company has demonstrated the Cell's ability to render a 3-D image from a CT scan faster than existing technologies.

A CT scan takes up to 1,000 two-dimensional images or slices, which must then be converted into a 3-D image, said Joel Radford, Mercury's vice president. Current technology can take hours to crunch all the data into a single 3-D image.

The Cell, designed to render detailed 3-D video game scenes, excels at producing similar medical 3-D images, Radford said.

"If it takes too long to render the images, the patient will have to go home and come back," Radford said. "There's also a cost concern if you tie up expensive computers for several hours.

"The Cell processor offers a blend of patient benefits and economy."

Schulten and his group plan to consider the Cell processor as a potential lab tool.

They also are looking forward to the release of Nintendo's Wii console. They want to see if the system's innovative controller can take the place of the $1,500 equipment used to interact with simulated molecules similar to the way a game player interacts with the worlds of "Halo" or "Grand Theft Auto."

Unlike conventional controllers, the Wii's remote will direct on-screen action when swung like a sword, golf club or tennis racket.

"We are interested in seeing the Wii," Schulten said. "Anytime technology becomes a commodity, it costs less than specialized equipment."

Games themselves have the potential to be used for serious purposes. The Army uses a game as a recruiting tool. Another game trains police, firefighters and other emergency personnel in handling serious situations. Traditional churches and alternative religions also offer serious games.

At the San Diego Supercomputer Center, researcher Steve Cutchin, straddles the line between hardware and software spinoffs. Cutchin is looking at non-game uses for the technology that powers MMO, or massively multiplayer online, games such as Sony's "Everquest II" and Blizzard's "World of Warcraft."

In one potential application, Cutchin is working with a 10th-grade teacher to create an online world, or MMO level, where students can meet and jointly explore physics. While set up to be entertaining, the level is designed to teach the state's curriculum requirements for physics.

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Educators are among the first to embrace the serious potential for MMO technology, but there are other areas where it could contribute, Cutchin said.

Any set of 3-D data could be easily converted into a game level, he said. In the past, Cutchin has built levels from 3-D maps of the San Diego area.

Some researchers have started to share complex data, such as computer-simulated 3-D protein structures.

"There's a lot of data out there," Cutchin said. "Researchers tend to kind of hold it in a box where no one else can see it. This would be a way to share it, to let others look at it in 3-D."

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