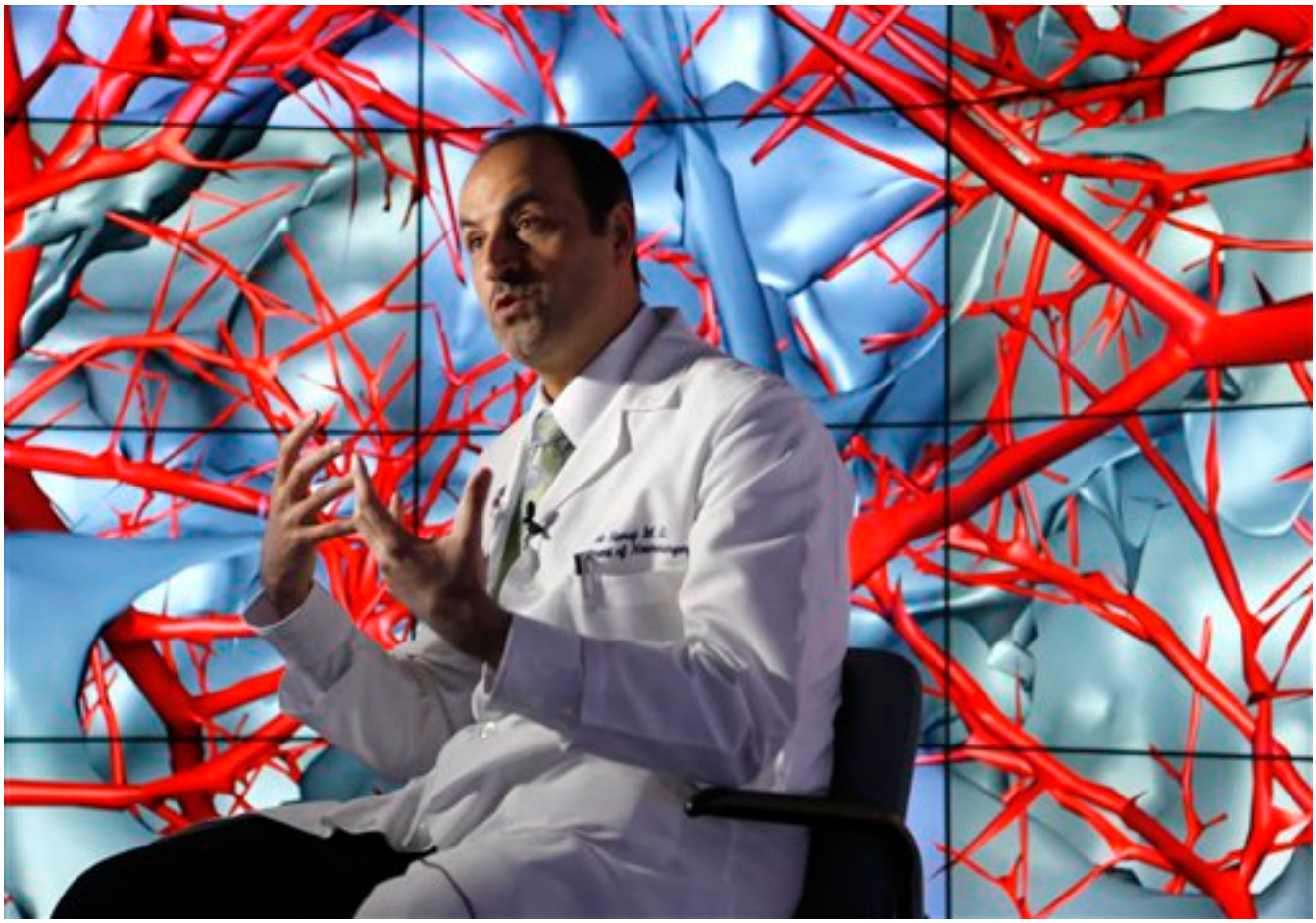
# Future Science: Using 3D Worlds to Visualize Data

CARLA K. JOHNSON,AP Medical Writer



CHICAGO (AP) — Take a walk through a human brain? Fly over the surface of Mars? Computer scientists at the University of Illinois at Chicago are pushing science fiction closer to reality with a wraparound virtual world where a researcher wearing 3D glasses can do all that and more.

In the system, known as CAVE2, an 8-foot-high screen encircles the viewer 320 degrees. A panorama of images springs from 72 stereoscopic liquid crystal display panels, conveying a dizzying sense of being able to touch what's not really there.

As far back as 1950, sci-fi author Ray Bradbury imagined a children's nursery that could make bedtime stories disturbingly real. "Star Trek" fans might remember the holodeck as the virtual playground where the fictional Enterprise crew relaxed in fantasy worlds.

The Illinois computer scientists have more serious matters in mind when they hand visitors 3D glasses and a controller called a "wand." Scientists in many fields today share a common challenge: How to truly understand overwhelming amounts of data. Jason Leigh, co-inventor of the CAVE2 virtual reality system, believes this technology answers that challenge.

"In the next five years, we anticipate using the CAVE to look at really large-scale data to help scientists make sense of that information. CAVEs are essentially fantastic lenses for bringing data into focus," Leigh said.

The CAVE2 virtual world could change the way doctors are trained and improve patient care, Leigh said. Pharmaceutical researchers could use it to model the way new drugs bind to proteins in the human body. Car designers could virtually "drive" their new vehicle designs.

Imagine turning massive amounts of data — the forces behind a hurricane, for example — into a simulation that a weather researcher could enlarge and explore from the inside. Architects could walk through their skyscrapers before they are built. Surgeons could rehearse a procedure using data from an individual patient.

But the size and expense of room-based virtual reality systems may prove insurmountable barriers to widespread use, said Henry Fuchs, a computer science professor at the University of North Carolina at Chapel Hill, who is familiar with the CAVE technology but wasn't involved in its development.

While he calls the CAVE2 "a national treasure," Fuchs predicts a smaller technology such as Google's Internet-connected eyeglasses will do more to revolutionize medicine than the CAVE. Still, he says large displays are the best way today for people to interact and collaborate.

Believers include the people at Marshalltown, Iowa-based Mechdyne Corp., which has licensed the CAVE2 technology for three years and plans to market it to hospitals, the military and in the oil and gas industry, said Kurt Hoffmeister of Mechdyne.

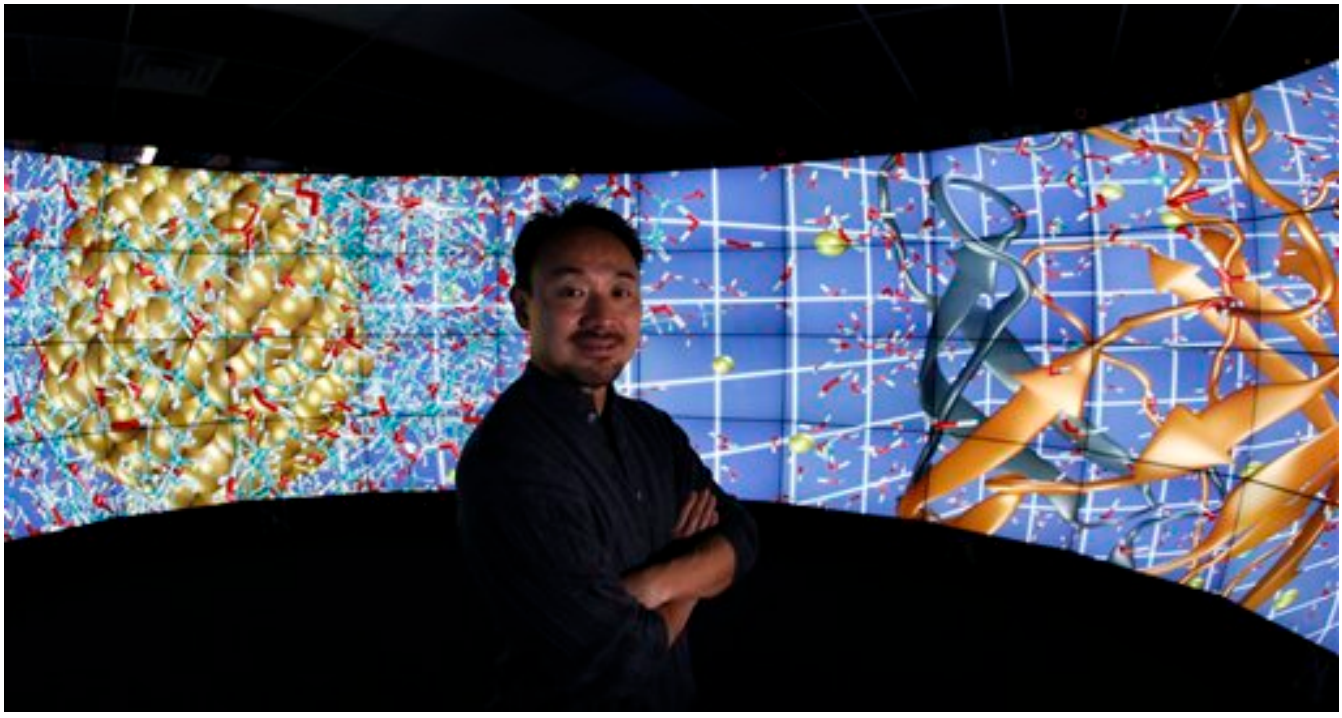
In Chicago, researchers and graduate students are creating virtual scenarios for testing in the CAVE2. The Mars flyover is created from real NASA data. The brain tour is based on the layout of blood vessels in a real patient.

Brain surgeon Ali Alaraj remembered the first time he viewed the brain using the CAVE2.

"You can walk between the blood vessels," said the University of Illinois College of Medicine neurosurgeon. "You can look at the arteries from below. You can look at the arteries from the side.... That was science fiction for me."

Would doctors process information faster with fewer errors using CAVE2? That's the question behind a proposed study that would compare CAVE2 to conventional methods of detecting brain aneurysms and determining proper treatment, said Andreas Linninger, UIC professor of bioengineering, chemical engineering and computer science.

But it's not all serious business at the lab.



In his spare time during the past two years, research assistant Arthur Nishimoto has been programming the CAVE2 computer with the specifications for the fictional Starship Enterprise. He now can walk around his life-size recreation of the TV spacecraft.

The original technology, introduced in the early 1990s, was called CAVE, which stood for Cave Automatic Virtual Environment and also cleverly referred to Plato's cave, the philosopher's analogy about shadows and reality. It was named by former lab co-directors Tom DeFanti and Dan Sandin.

The second generation of the CAVE, invented by Leigh and his collaborator Andy Johnson, has higher resolution. The project was funded by the National Science Foundation and the Department of Energy.

"It's fantastic to come to work. Every day is like getting to live a science fiction dream," Leigh said. "To do science in this kind of environment is absolutely amazing."

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