

Applied Modeling and Visualization

CENTER FOR ADVANCED ENERGY STUDIES

An INL researcher views BISON data inside the Computer-Assisted Virtual Environment at CAES.

Augmented & Virtual Reality for Better Data Visualization

When it comes to presenting and understanding data, virtual and augmented reality are poised to revolutionize industry and academia.

Instead of spreadsheets, pie charts and line graphs, the time has come when it is possible to view data in multidimensional, immersive ways, offering research scientists and engineers revelatory new insights. Virtual reality exploration systems offer the ability to create visualizations of large data sets that can be transmitted and run in real-time simulations. Using

six-degrees-of-freedom input devices — which allow a body to move forward and backward, up and down, left to right — and stereoscopic output, they offer the benefits of more realistic interaction.

Since the introduction of the Computer-Assisted Virtual Environment (CAVE) in 2010, the Center for Advanced Energy Studies (CAES) has been able to provide a user facility where researchers from universities, industry and government agencies can visualize and address technical challenges.



EXPLORE

Energy and Environmental Research



EDUCATE

Energy and Environmental Education



ENGAGE

Apply Knowledge to Industry



ENABLE

Energy Transitions and Economic Development

The CAVE

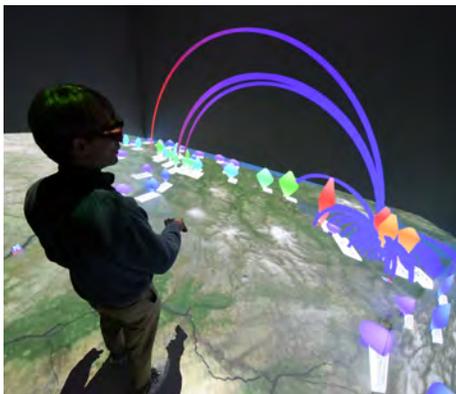
This four-panel system uses rear projection to display computer graphics on three walls and the floor. Data can be loaded quickly into the system. Wearing stereoscopic glasses to create depth perception and using a wand to manipulate and control data, researchers can do such things as tour a building yet to be erected, plot a new power transmission line over topographically accurate terrain, assess environmental impacts over time, or delve into the core of a nuclear reactor.

Although its first and most important purpose is data analysis and collaborative research, the CAVE environment also can

be used to communicate research results to key stakeholders, offering unique perspectives that enable people to make scientific connections that might otherwise be difficult. CAES also has provided portable systems to Boise State University, Idaho State University and University of Idaho to help enhance their modeling and simulation capabilities. The University of Wyoming 3-D Visualization Center houses a four-wall 3-D CAVE similar to the CAVE located in CAES. This CAVE offers researchers the ability to model oil, gas, and water movements, and interactions in the subsurface environment.



University of Wyoming's Shell 3-D Visualization Center (Photo courtesy UW).



A 3-D visualization in the CAES CAVE of data from a study of electric vehicle charging in the Pacific Northwest.

Augmented and Virtual Reality

At CAES, the goal is to provide the latest, most sophisticated tools and expertise for researchers and engineers in the public and private sectors. As virtual and augmented reality technology evolves, the feeling of immersion will improve and become seamless. Augmented reality solutions are envisioned to allow researchers to have CAVE-like experiences anywhere. These include new virtual reality headsets, web-based 3-D geographic information

systems (GIS), mobile (phone and tablet) applications, and serious games (i.e. games built for training or educational purposes), allowing users to research problems at their desks and in the field, enabling discovery outside the lab.

The main question with regard to data visualization is this: How do we take advantage of three dimensions to efficiently structure and represent data?

About CAES

The Center for Advanced Energy Studies (CAES), a consortium of Idaho National Laboratory, Boise State University, Idaho State University, University of Idaho, and University of Wyoming, is a public/private research center that provides research capabilities, energy-related educational opportunities, and industry assistance to fuel economic growth.

FOR MORE INFO

James Money
Director of Visualization
(208) 526-7256
james.money@inl.gov
www.caesenergy.org

Julie Ulrich
Communications
(208) 526-1572
julie.ulrich@inl.gov

