

Applied Modeling and Visualization

CENTER FOR ADVANCED ENERGY STUDIES

Interactive and Immersive Visualization for Improved Understanding

When it comes to presenting and understanding information, augmented, virtual, and mixed reality are poised to revolutionize industry and academia. Instead of spreadsheets, pie charts, and line graphs, it is now possible to view complex datasets in dynamic, multidimensional, immersive ways that communicate insights faster, more effectively, and in real time. This capability offers

research scientists and engineers improved understanding of the models, datasets, and environments they are working with.

Virtual reality exploration systems offer the ability to create visualizations that can be projected and run in real-time simulations. Using three-dimensional tracking devices, special handheld remote controls, and stereoscopic glasses, the researcher is able to move above, below, around, and through the visualization, providing a realistic experience.

The Center for Advanced Energy Studies (CAES) opened its first Cave Automatic Virtual Environment (CAVE) in 2010. With an updated CAVE installed in 2017, CAES' Applied Visualization Laboratory is now even better equipped to provide researchers from universities, industry, and government agencies with a user facility where they can visualize and address scientific and technical challenges.

Pictured above: An Idaho National Laboratory researcher interacts with an immersive, three-dimensional model inside the Cave Automatic Virtual Environment in the Center for Advanced Energy Studies.



EXPLORE

Energy and Environmental Research



EDUCATE

Energy and Environmental Education



ENGAGE

Apply Knowledge to Industry

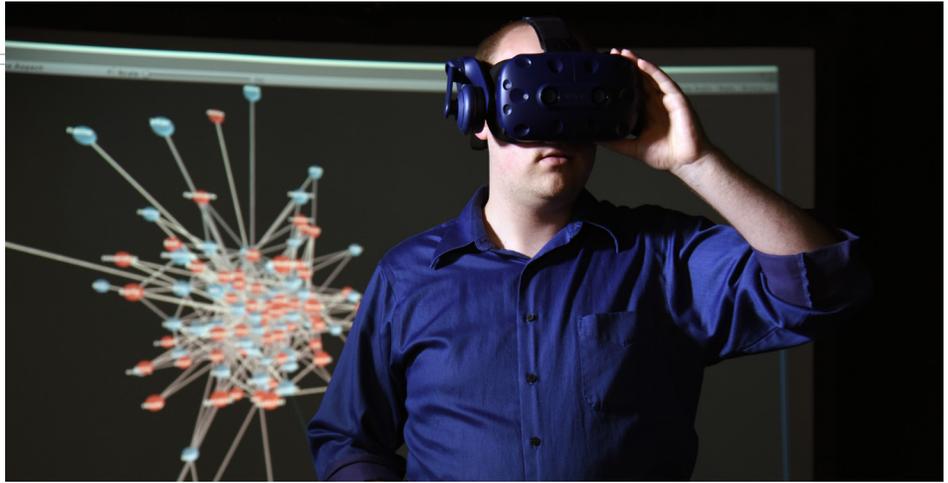


ENABLE

Energy Transitions and Economic Development

The CAVE

This four-panel system – 12'x12'x7.5' – uses rear digital projection to display computer graphics on three walls and the floor. Large datasets 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 study such things as contaminant flows through water systems, plot construction of new power transmission lines over topographically accurate terrain, or examine graphite billets from a nuclear reactor.



The updated CAVE uses rear digital projection projectors to display computer graphics on three walls and the floor, which can be viewed through stereoscopic glasses and manipulated with a wand.



Augmented reality solutions can be viewed using virtual reality headsets such as Samsung Gear VR and HTC Vive, or even the low-cost option of Google Cardboard.

Augmented, Virtual, and Mixed Reality

As augmented, virtual, and mixed reality technologies evolve, the opportunities for portable, in-depth analysis of complex datasets increases. Augmented reality solutions are envisioned to allow researchers to have CAVE-like experiences anywhere. These include virtual reality headsets such as Samsung Gear VR and HTC Vive, Magic Leap One, or even the low-cost option of Google Cardboard. A Virtuix Omni Treadmill can be utilized when the environment requires a large physical space. Web-based 3-D geographic information systems, mobile applications (for both phone and tablet), and serious games (games built for training or educational purposes) allow users to conduct research at their desks or in the field, enabling discovery outside the lab.

Scientific research projects at CAES and INL use a suite of open-source data science software tools called the Scientific & Intelligence Exascale Visualization Analysis System (SIEVAS). Tools such as Paraview, Matlab, Visit, and Google Earth can be easily connected to SIEVAS to allow for tight integration into the users' existing workflows.

Although its chief purpose is data analysis and collaborative research, CAES's Applied Visualization Laboratory 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. New technologies can help everyone make better sense of the physical world, identifying irregularities and patterns that allow for the advancement of scholarship and improved quality of life.

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

John Koudelka

Director of
Visualization
(208) 526-8591
john.koudelka@
inl.gov

www.caesenergy.org

Matthew Evans

Communications
(208) 526-6225
matthew.evans@
inl.gov

