Design Visualization

Full-Scale Visualization: More Is More
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Building stakeholders experience data full-size, speeding design decisions and saving money.

Users today value design visualization for its ability to make 3D CAD data appear life-like. But what if you could take that same data, immerse yourself in it, and walk though it life-size?

That technology is not only available, it’s accessible, affordable, and making inroads for AEC applications. Inside full-scale analysis simulators at Duke University and Iowa State University, translated 3D CAD data is projected onto the walls, ceiling, and floor of the room-sized units. Iowa State’s six-sided CAVE (Cave Automatic Virtual Environment) displays the highest resolution available anywhere (100 million pixels), is powered by 24 projectors, and requires stereoscopic glasses for viewing and a joystick controller to navigate through the data.
The CAVE simulation unit fits inside a room but gives users the experience of viewing 3D building data full-size.

CAVE technology isn't new; it's been around for more than 20 years. But now it is becoming more accessible to AEC, largely due to the efforts of David Fuller, president of FullCon Solutions. Fuller works as the liaison between the two universities that own the multimillion-dollar units and the clients who wish to rent them. FullCon markets the technology, manages scheduling and logistics, and prepares and converts the 3D CAD data files for full-size consumption. All the client needs to do is show up.

Fuller's AEC clients are primarily in commercial construction, and they work primarily with 3D data from SketchUp, Revit, and Rhino software. However, virtually any 3D data can be converted for simulator viewing. "We haven't been stumped yet," Fuller said, referring to his company’s data-conversion track record. The exception is point cloud data, he said. "It must first be converted to polygons."

The Full Experience

Experiencing data at full size helps building designers, contractors, and owners feel confident and secure that their design is effective and attractive long before the project breaks ground. In fact, Fuller said, he finds the sweet spot for his service is helping clients during the
schematic design process. “[The technology] brings valuable feedback to early stages of design, the least profitable and most indecisive stage for architects and owners,” Fuller explained. The simulators help project stakeholders operate much more efficiently and save money because decisions come more easily and changes can be made before they become costly.

Mark Vaughn, senior principal of WHR Architects and a FullCon client, said, “As part of our schematic design process, the simulator helped our client better visualize overall form, scale, degree of spatial transparency and natural lighting, and proposed vehicular–pedestrian circulation. Live model simulation is unique and has offered the design team and our client the ability to test-drive our proposed solution.”

Using the simulator “completely levels the playing field,” Fuller said, so even non-architectural people can better understand a design — and when they understand a design better, they can discuss it better. “That is pretty tough to achieve today on a laptop, even if it’s plugged into a [large plasma screen].”

FullCon client Curt Carlson, director of business development at Resolute Building Company, concurred. “By standing in the simulator, we got the sensation of actually being in the yet-to-be-constructed facility, with a sense of realism that is as close to the real thing as you can get. It was much more effective than simply viewing static perspective drawings or computer-aided fly-throughs. The stereoscopic glasses, along with being able to literally walk through the building by using the joystick, were liberating.

“In the future,” Carlson continued, “we see using this tool to not only help the owners visualize their facilities but to help our superintendents and subcontractors analyze complicated details like windows, walls, and roof line details.”

For the architects themselves, Fuller said, “You can use this technology to view ‘space,’ avoiding months that architects can spend discussing it. This tool would enhance and shorten that discussion. We can show them a building full-scale before they ever cut a tree.”

Applications Beyond AEC

Users in other industries rent the CAVEs for purposes such as military training or preplanning of complicated surgeries. “You can make a brain the size of a truck,” Fuller said. Any application that relies on 3D data could potentially benefit. “We could help a lot of other industries,” Fuller said. “They just don’t know about us yet.”
The simulators' primary purpose, of course, is academic — for example, researching phobias (such as heights or flying) or educating medical students.

When it comes to his commercial clients, Fuller said, much of the interest comes from large organizations — for example, leasing agents working to fill office towers before the tower is built — but the technology is not out of reach of smaller firms. “We had one customer building a $2 million vet clinic. He was able to walk his client through the design before it was final and well before construction kicked off, ultimately saving the client approximately $15,000 in change orders,” Fuller recalled.

Only nine full-scale analysis simulators in the world are accessible to the public, and four of those are located in the United States, Fuller said. He’s working with the owner of a third unit in hopes of signing an agreement by year-end. He’s also working to make available a portable simulator that FullCon would use in a client’s office — a scaled-down, single-wall, portable solution.

The cost to rent the full-scale simulator typically ranges from $1,200 to $1,800 per visit, depending on the size and number of files and time needed on the system. “Often clients come back, if it’s affordable, and view a design at multiple stages,” Fuller said.