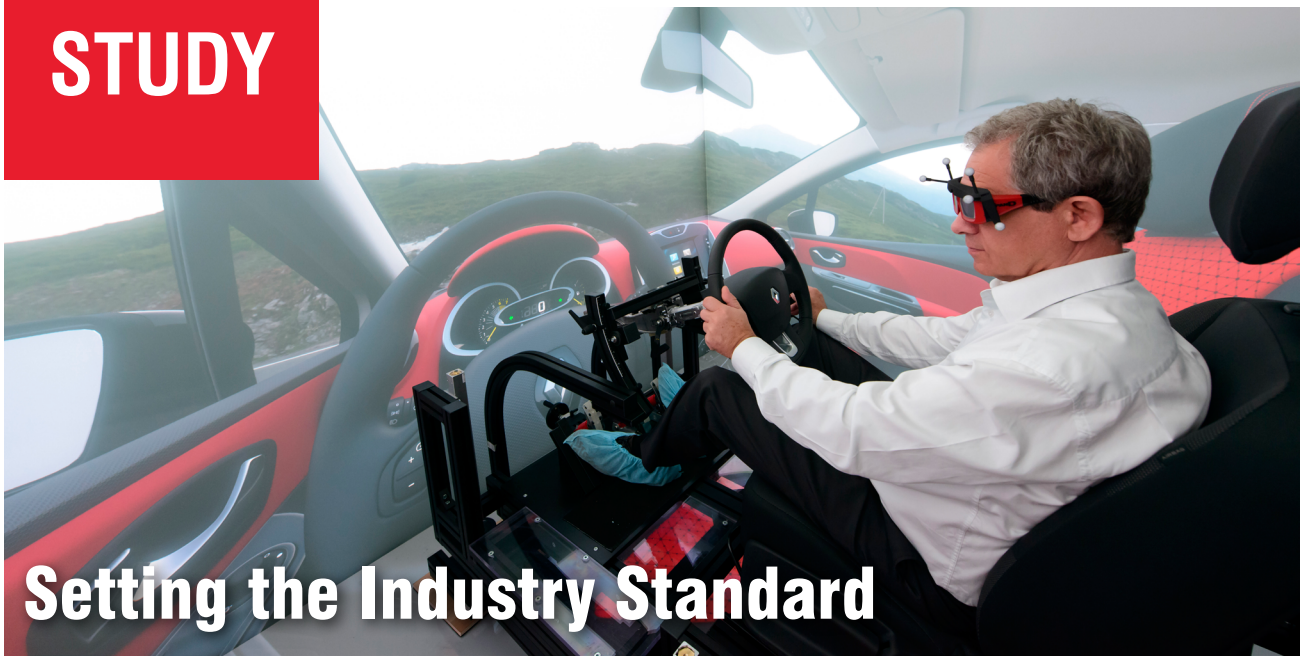
CASE STUDY



Setting the Industry Standard

All photos courtesy of Alain Goulard, Médiathèque Renault

Renault's Vehicle Design in the Mechdyne CAVE

Paris, France

French automobile manufacturer Renault recently implemented a new CAVE (Cave Automatic Virtual Environment) facility at their Paris headquarters. The new facility boasts the highest resolution ever realized in a virtual reality environment, with five sides of Sony-based display system, delivering a total of 70M 3D images.

Making Virtual Reality More Real

While VR technology is hardly new, its evolution in recent years has experienced something of a quantum leap. As Moore's Law has continued to contribute to ever-increasing processing power and ultra-high resolution display technologies, the cartoon-ish, low bitrate virtual worlds of yesterday are distant nostalgia, as today's stunningly realistic environments come ever closer to the real thing.

The audience for VR technology has also shifted. No longer the province of the gaming industry, VR emulation has become an integral part of a wide swath of industries, from military and pilot training, architecture, and medical research, to aerospace and automobile design.

Ahead of the Curve

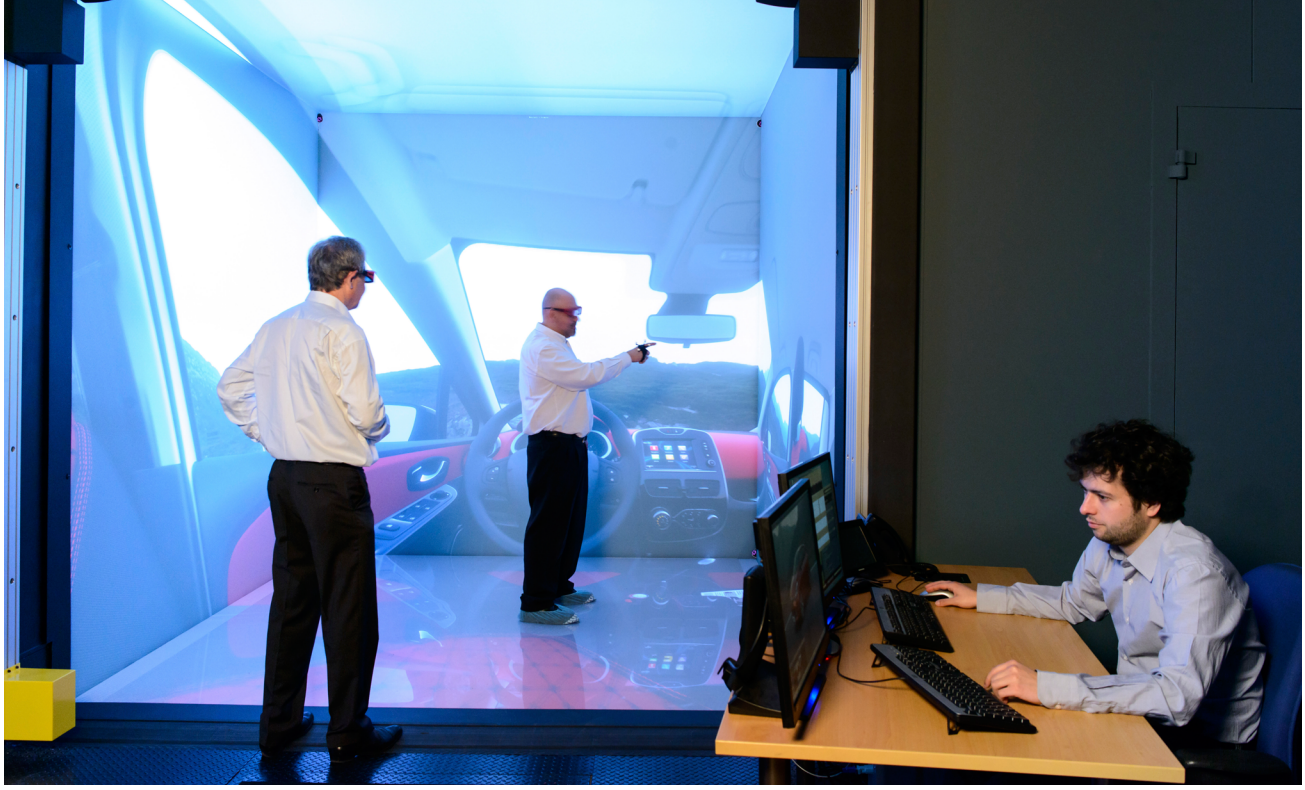
VR powerfully advances automobile designers from the days of clay models and wind tunnels. French automobile manufacturer Renault, who recently completed a CAVE facility, is a case in point.

While Renault is not the first auto manufacturer to implement CAVE technology, the company's facility is one of the most advanced.

Renault's Virtual Reality and Immersive Simulation Technologies Center spearheaded

Challenges

- Create a VR environment that can deliver a highly detailed, ultra-realistic experience for designers an engineers
- Work within existing environmental, architectural, and budgetary constraints



the project. The Center's founder and director, Andras Kemeny, has been involved in simulation technologies since their earliest days. Kemeny is also a professor at the respected Institut des Sciences et Technologies de Paris (Paris Institute of Technology), with more than 150 published works on VR and driving simulation, and is the Director of the Laboratory of Immersive Visualization, a research facility shared with Renault and Paris Tech.

"At Renault, we were of course aware of CAVE technology from the very beginning, around 1990," says Kemeny. "We had many talks with others in the field, including the Fraunhofer Institute in Stuttgart, where they had an early six-sided CAVE. At the time, the general consensus at Renault was that the image quality and frame rate were not sufficient for our use." Renault opted instead to pursue head mounted display technology, with Kemeny's research in the area receiving considerable accolades in its own right.

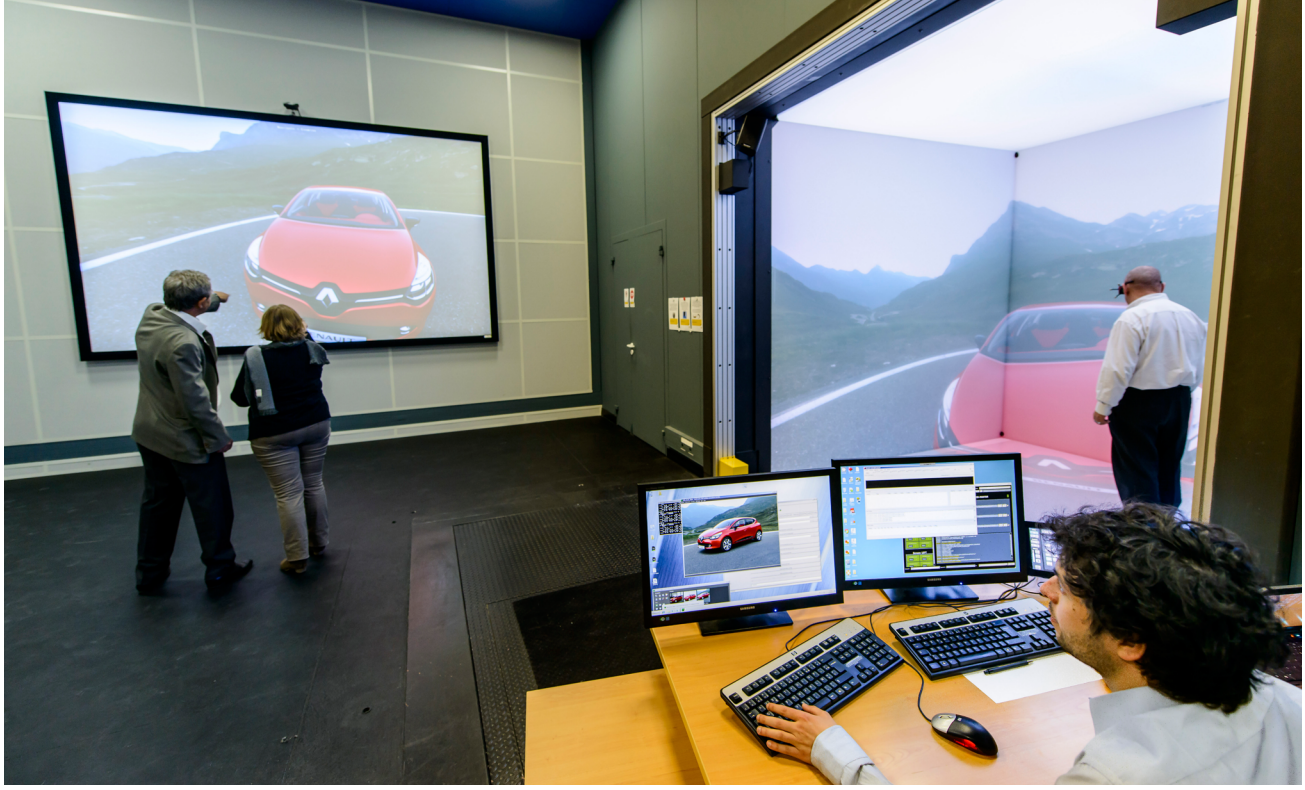
The Time is Right

Nearly a quarter century later, technology is catching up to the promise of what VR can offer. The supercomputers once beyond reach are now in our pockets, and the power to create a truly immersive experience is matched by the ultra-high resolution of today's displays. As Andras Kemeny explains, the technology was finally worth revisiting.

"I was teaching a class at Paris Tech a few years ago, and one of the invited professors was Jim Oliver, who was the head of Iowa State University's VRAC (Virtual Reality Applications Center) facility," explains Kemeny. "They had one of the very first 4K CAVE systems, and it was really very impressive. Once we could see what was now possible, we felt it was finally time to move forward with CAVE technology."

Kemeny's high standards ensured that the new Renault facility would not merely meet the state of the art, but redefine it. Renault partnered with Mechdyne Corporation, a leader in VR and visual technologies, to design and implement a new CAVE facility that would exceed anything currently in operation.

"Renault approached us to bid on the project because we had already built a six-sided CAVE of that resolution, and we understood the challenges," explains Mechdyne's Richard Cashmore. "Andras had already viewed the CAVE system at the VRAC in Iowa, and had a clear



concept of what he wanted to do. We had a number of meetings with them to talk about their ideas, and we worked with them to create a solution that would fit their budget, as well as address their space limitations, including a height restriction on the ceiling."

Brand Agnostic

"We wanted to work with a company who could provide us with a holistic, integrated system, including structure, projection, and computers," Kemeny explains. "While many of the leading manufacturers have provided exceptionally good support and advice, we found that Mechdyne was not bound to a specific brand or a specific technology. They were able to look at the entire technological landscape, and consider combinations of different brands and products. Their approach was very focused on our specific goals, rather than on whatever technology they favored."

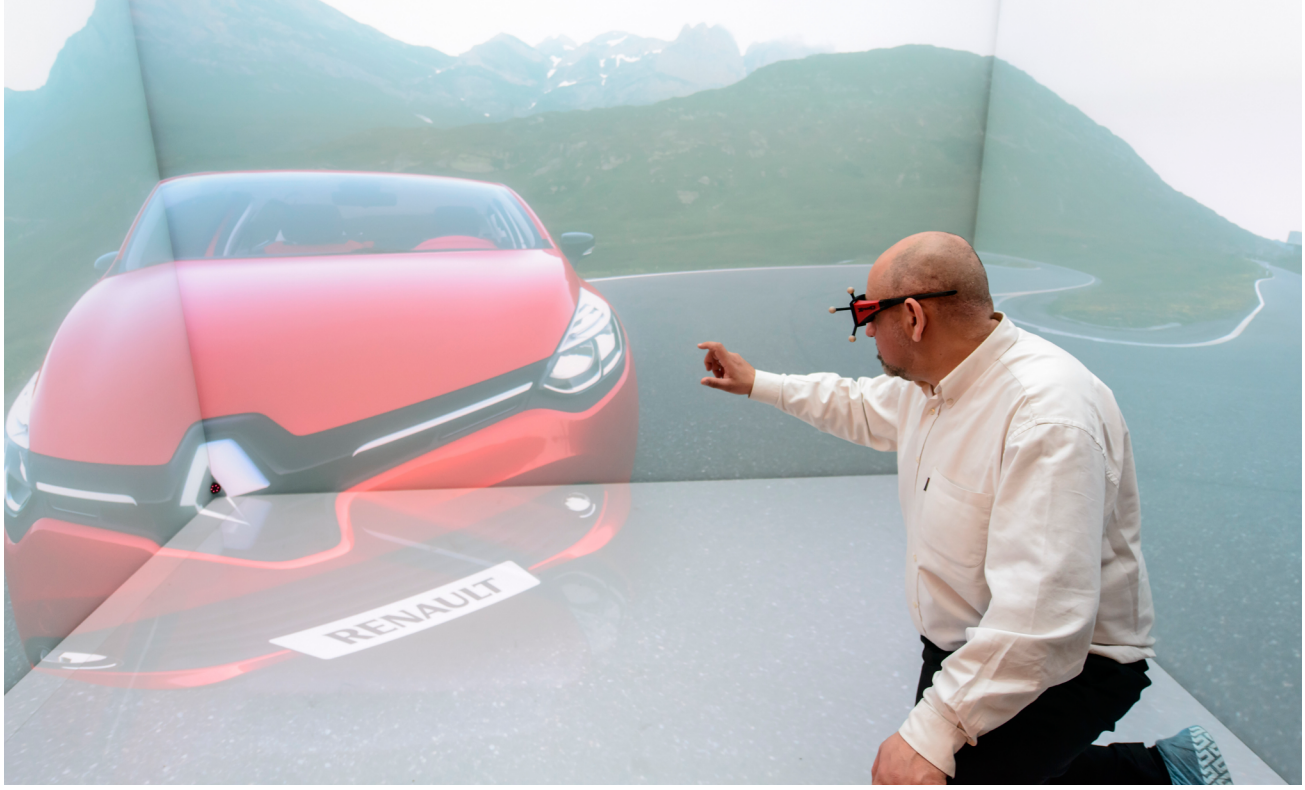
The system includes five sides of Sony and DP 4K projectors, delivering a total of 70M 3D pixels. "While there were some other options using newer DLP projection, ultimately, the Sony system delivered the fastest performance and the highest resolution, both of which were critical factors," observes Cashmore.

Kemeny adds, "In this case, the Sony projector Mechdyne specified was originally designed for cinema-based solutions. Calibrating multiple projectors was not something Sony had addressed for this market. Sony provided us some data, and then our engineers at Renault and Mechdyne collaborated for several months to design a calibration protocol. We've been quite happy with the results."

The CAVE and supporting Powerwall are also equipped with three Digital Projection Titan WUXGA projectors and Stewart Filmscreens. The computing and rendering system comprises 18 rendering nodes and another head node, with each machine equipped with two NVIDIA Q6000 graphics processors, which have since been replaced by K6000 graphics processors. An ART optical tracking system follows the user's perspective.

Power in Collaboration

As both parties have observed, the collaboration between Renault and Mechdyne created a



powerful synergy. "Originally, the relationship was that of client and provider, but over time it really evolved to where we were all really part of the same collaborative project," says Kemeny.

"I think that's one thing that's unique about our approach," observes Cashmore. "We really try and look at the project through the eyes of the end user. We're not trying to sell whatever technology we've got in stock. We can recommend what we feel is best for them, given their goals and the technologies available."

Kemeny agrees. "Some other providers were able to design a complete system, but Mechdyne was the only provider at the time who could propose a complete turnkey system at this level of complexity, as well as support, both during its construction and throughout its implementation."

Though Renault's CAVE was initially created for vehicle architecture and interior ergonomic design, Kemey reports that the technology has become popular with other departments within the organization, including vehicle styling and interior and exterior lighting, as well as a large number of specific applications in different areas. "One thing that was very exciting for us was the fact that the CAVE was being embraced by various departments within Renault," he says. "Ultimately, this is enabling us to build a better vehicle."

In fact, the Renault CAVE has led to discussions with Daimler (parent company of Mercedes Benz) on a new collaborative project. "There has long been a strong working relationship between Renault and Daimler," says Kemeny.

"The collaboration with Mechdyne gave us the most state-of-the-art facility in the automotive industry at the time," Kemeny concludes. "It's a system we are very proud of, and we already work on new versions and other installations worldwide within our organization."

About Mechdyne

Mechdyne is one of the world's leading providers of innovative visual information technologies. Mechdyne bends technology to our will in ways that transform complex data into insights and ideas. To ensure our customers succeed, Mechdyne provides comprehensive, customized solutions that include consulting, software, technical services, and hardware integration.