



REALTIME TECHNOLOGIES AND THE CUTTING-EDGE WORLD OF VEHICLE SIMULATION

Inside a large laboratory on Ohio State University's Columbus campus, two cars collide.

The first vehicle, a dark sedan, lurches forward, its front bumper clipping the rear of its counterpart. The screech of tires reverberates around the room, followed by the loud pop of plastic smashing metal. But though the crash looks, sounds, and feels real, no debris flies and no one is injured. The offending "car" doesn't even have wheels, its tires replaced with an intricate maze of pistons and struts that fire to mimic the curves and bumps in a road. The second car is nothing more than an animation—albeit a hyper-realistic one—projected onto an immersive set of floor-to-ceiling screens stationed in front of the sedan.

While much of what goes on in the OSU lab is smoke and mirrors, the data, results, and subsequent impacts on the human driver behind

the wheel are all very real. The technology behind these simulations, developed by Royal Oak, Michigan-based Realtime Technologies, with support from several U.S. Army Small Business Innovation Research (SBIR) awards, has been used in a wide variety of applications, from training school bus drivers and military vehicle operators to informing policy and law by modeling road safety hazards and studying driver behavior.

The company was founded in 1998 by Richard Romano, a vehicle dynamics specialist widely considered the father of driving simulation. Romano singlehandedly developed what would later become the backbone of the Realtime's simulator software, a program called SimCreator. A graphical, hierarchical simulation system that updated scenarios in real time, SimCreator was the high-tech canvas upon which the rest of the company's offerings were



later built. SimCreator is, as Realtime General Manager Heather Stoner said, the “heart and soul of the company.”

“Around 1998 there were very few companies and universities making driving simulators. It was in its infancy,” Stoner said, describing the “rooms full of servers” required to power such tech. “Rich saw a need in the industry to improve and connect all the aspects of simulation during his time working at the Iowa Driving Simulator; the audio, the terrain and the external variables.

“This development allowed Realtime to provide software and systems that allowed researchers to have highly adaptable software for most any research they wanted to conduct. In general, all driving simulator researchers want to feel unique. Realtime provides a tool set for the researchers to accomplish whatever research that they would like to develop their experiments,” she continued. “The key to our experience is helping these parties study the human factors of driving, for example the cognitive processes involved in the driving task, as well as other variables like motion and sound, all while still operating the vehicle.”

While applications like autonomous driving were still years away from gaining commercial market appeal, other sectors, such as the U.S. military, were interested in using Realtime’s technology to simulate combat and training scenarios to better prepare troops for what to expect on the battlefield. Right down the road in Warren, Michigan, the Army Tank-automotive and Armaments Command (TACOM), was one of the first to put the company’s tech to use.

Located just next door to the headquarters of some of the

largest automotive manufacturers in North America, Realtime began considering how best to push its simulators into the commercial market. First, the company needed to refine its tech, offering its customers something both versatile and fully customizable. And that, said Stoner, is where the SBIR program came into play. Starting from a foundation of several SBIR contracts,

“The SBIR program really helped us because it gave us that little bit of seed money to prove our ideas,” Stoner said.

Realtime was able to complete one of its most successful SBIRs, called “Simulator Monitor and Control.” This SBIR was the foundation of the RTI product “SimVista.” SimVista is a “scenario authoring system” that allows users to build comprehensive simulation scenarios based on their own needs.

SimVista, Stoner said, was a game changer, and allowed the company to set itself apart from burgeoning competition.

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In the automotive industry, as well as in the defense sector, the applications for their software are almost limitless, Stoner added. Insurance companies such as Liberty Mutual have used the simulation tech to research

questions like how distractions impact driver performance. Car companies use Realtime’s software to test their own equipment or to provide data points regarding driver tendencies. Research bodies, like OSU, have enlisted Realtime to help it study a variety of driver-based questions, such as how reaction time changes with age, or to look into improvements that could assist differently-abled drivers.

“The Realtime driving simulator will be invaluable in terms



Heather Stoner



The technology behind Realtime's driving simulations has been used in a wide variety of applications.

of supporting new and current research, attracting new students and grants, and building an overall strong reputation for my lab over the years," said Nate Ward, an assistant professor at Tufts University. "I look forward to citing the company in my publications and grants, as well as at human factors conferences in the coming years."

In 2008, the company was purchased by FAAC Incorporated, a simulation training company headquartered in Ann Arbor that has a long history of providing world-class simulation solutions to the Department of Defense as well as commercial and municipal organizations. Part of FAAC's portfolio includes driver training simulators for military, municipal transit, and public safety personnel. The addition of Realtime Technologies expanded FAAC's customers beyond the training sector to include research applications educational institutions and automotive companies. In



the years following the acquisition, Realtime moved into the new and rapidly expanding field of self-driving vehicles, working with Google and several car manufacturers along the way.

Now, building on its SBIR roots, the company is in the midst of developing a new simulation product—an offshoot of the SimVista line that will allow users, like those in the OSU lab, to build fully customized simulations in less time and with less hassle than ever before. The yet-unnamed product, Stoner said, will "revolutionize how researchers develop experiments."

"When they get their simulator in their lab, they will be able to build an experiment within a week," she said. And then added, "The industry as a whole is moving quite quickly and, in general, it's becoming more affordable," Stoner added. "But with our technology, there are thousands of research questions that can be answered with one tool set." 🌸

Realtime Technologies (FAAC, Inc.) • Royal Oak, MI (Ann Arbor, MI)
Modernization Priority: General Warfighting Requirements (GWR)

SBIR contract: W56HZV-05-C-0652 • Agency: Army • Topic: A04-239, Multi-Resolution Modeling of Ground Platform Dynamic Performance and Mobility
SBIR contract: DAAE07-02-C-L002 • Agency: Army • Topic: A00-170, User Interaction Tools Supporting Applications in Immersive Virtual Environments
SBIR contract: DAAE07-03-C-L003 • Agency: Army • Topic: A01-222, Simulator Monitor and Control (SMAC) System
SBIR contract: W56HZV-04-C-0709 • Agency: Army • Topic: A03-224, Development of High-Resolution Virtual Terrain for Use in a Motion-Based Simulator with an Image Generator

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