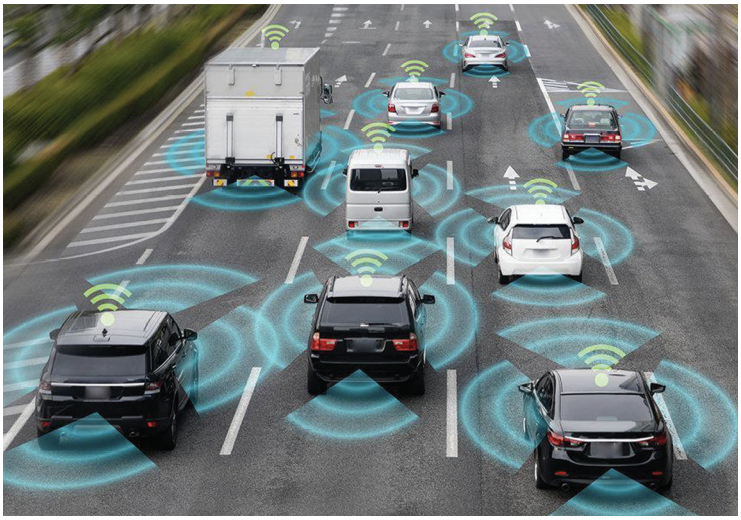
CAVTEC Moves Connected and Autonomous Vehicles Forward

BY JOHN R. HUGHES

Smart mobility solutions—such as connected infrastructure, autonomous vehicles, data-driven mobility and intelligent transport systems—are gaining ground in the transportation industry. To further these emerging smart mobility solutions, Space Institute Research Corp. (SIRC), an independent research and development organization at the University of Tennessee Space Institute (UTSI), recently partnered with Stantec to develop the Connected and Autonomous Vehicle Technology Evaluation Center (CAVTEC).



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Automation is playing a huge role in the development and emergence of enhanced and improved intelligent transportation systems.

CAVTEC, a 2,000-acre test bed on the UTSI campus, tests and develops future-focused solutions to optimize vehicles and infrastructure for connected technology. Through the unique partnership between SIRC and UTSI, the lab provides technology providers a place to demonstrate, test, and certify products and services.

Evaluating Vehicular Data Technology

Automated vehicular prioritization systems, traffic management, and even autonomous vehicles and driverless cars will come to depend on a sea of vehicular data to operate safely and efficiently. Edge computing, dedicated short-range communication technology and 5G wireless networks will be required to make this feasible. As part of the CAVTEC partnership's launch, SIRC and Stantec recently developed and field-tested an edge-computing environment to recognize and respond to wrong-way driver events.

"Edge computing is a distributed platform designed to deal with all the mobile devices out there, including car computers," explains Jeff Albee, principal of Stantec's Client Technology Services practice. "The latency of a traditional networking environment doesn't work well with computers traveling at 70 mph, so a new infrastructure technology is required. That's called 'computing at the edge,' which basically means computers sit on the edge of networks so they can provide high-transaction, high-throughput computing closer to where it's needed."

Conducted in April 2019, the one-day test evaluated infrastructure-to-infrastructure and infrastructure-to-vehicle communications as well as interoperability, data capture and overall accuracy related to wrong-way driver events. Three devices were tested separately and in combination to monitor a simulated ramp/lane configuration of highways and interstates driven by human-piloted vehicles. The test environment was captured, filtered, managed and transmitted by an advanced data network consisting of radar traffic sensors, cameras and edge-computing devices.

Stantec's role in the test involved engineering design, development and technical assistance in installing test equipment, along with providing post-test data analysis and reporting. SIRC focused on test management, establishing road test conditions, configurations and test analysis. Partners Cisco and Wavetronix donated test equipment. The test system greatly improved communication, mitigating the risk of an event and reducing false positives—a great example of how CAVTEC is already improving smart mobility.

"Wrong-way driver systems are commonly known to result in a lot of false positives," notes Albee. "In some cases, they're only 90 percent accurate. So if you have machines responding to a system that's only 90 percent

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accurate, you're going to be a lot less effective in addressing roadway incidents."

The alert technology tested at CAVTEC has the potential to facilitate infrastructure-to-infrastructure communication and cloud-based data transfer, enabling a safe and reliable detection and response to a wrong-way driver for the first time. The shortened response time to dangerous driving situations, once applied in real-world situations, will help reduce accidents and road fatalities.

"The entire team worked seamlessly to develop a structured and well-documented test process that can be replicated for future research and test clients," adds SIRC President Jim Jollife.

Future Work

Planned future testing on the site will expand to autonomous vehicles, watercraft and drones. Ultimately, SIRC aims to use the site to provide certification for smart mobility and infrastructure technologies through field testing at the CAVTEC facility.

"This test signifies the synergy of leveraging existing University of Tennessee infrastructure and test and evaluation expertise with leaders in smart mobility design and instrumentation," says Dr. Mark Whorton, UTSI's executive director. "This initial test sets the stage for increased collaboration with public and private partners."

"This is the first in a series of planned tests to develop real-world connected infrastructure systems to enhance the safety and efficiency of our infrastructure network," explains Albee. "Smart city and future mobility initiatives aren't always about replacing infrastructure. We can make smaller technology investments—sometimes at a fraction of the costs of big capital investments—to reach the goal of safer, more-efficient and more-reliable infrastructure that better serves people in our communities."

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Locally, Stantec is also supporting the Nashville Area Metropolitan Planning Organization, part of the Greater Nashville Regional Council, in a Regional Smart Mobility Assessment. The assessment will provide a long-range framework to help the transportation system prepare for and thrive in a multimodal environment where vehicles are connected, shared and automated.

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